DOCUMENT RESUME

ED 117 563 95 CE 006 277

TITLE Auto Mechanics. Instructional System Development Model for Vermont Area Vocational Centers.

SPONS AGENCY Office of Education (DHEW), Washington, D.C.; Vermont State Dept. of Education, Montpelier. Div. of Vocational-Technical Education.

REPORT NO VT-102-456

BUREAU NO V0087VZ

NOTE 213p.; For related documents, see CE 006 274-276; Not available in hard copy due to marginal legibility of original

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.

DESCRIPTORS *Auto Mechanics (Occupation); *Curriculum Guides; Instructional Materials; *Instructional Systems; Learning Activities; *Secondary Education; Shop Curriculum; Study Guides; Teaching Guides; Teaching Techniques; *Trade and Industrial Education; Unit Plan

IDENTIFIERS Vermont

ABSTRACT

The model curriculum guide was developed to teach automotive mechanics in secondary schools in Vermont. It is composed of a series of units related to tasks identified as skills, concepts, and values, which are stated in behavioral terms, supported by suggested learning activities, reinforced by teacher resource needs and suggested evaluation criteria or methods. A teacher planning document is provided for each unit, including objectives, lesson or unit plan, and suggested bibliography of material resources. Unit topics include: safety orientation, preventive maintenance, tires and wheels, exhaust systems, suspension systems, body-electrical, charging system, starting system, engine tune-up, State inspection, brake system, steering system, fuel system, cooling system, engine overhaul, clutch system, transmissions, drive lines, differential, automotive accessories, business management, and human relations. Related sheets and shop job sheets accompany the units. A bibliography and lists of audiovisual and other reference materials are appended as is information about criterion testing and teaching and evaluation methods. (JN)

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INSTRUCTIONAL SYSTEM DEVELOPMENT MODEL
FOR VERMONT AREA VOCATIONAL CENTERS

2

AUTO MECHANICS

The research herein was performed pursuant to the two contracts: Vocational Act 90-576 Part C Discretionary Funds United States Office of Education (U.S.O.E.) Grant number V0087VE; and Vermont Division of Vocational and Tchnical Education, Educational and Professional Development Act (E.P.D.A.) Funds Contract number EPD-F-74-6. Contractors are encouraged to express their professional judgements. Points of view or opinions stated do not necessarily represent official positions of the U.S.O.E. or the Vermont Department of Education.

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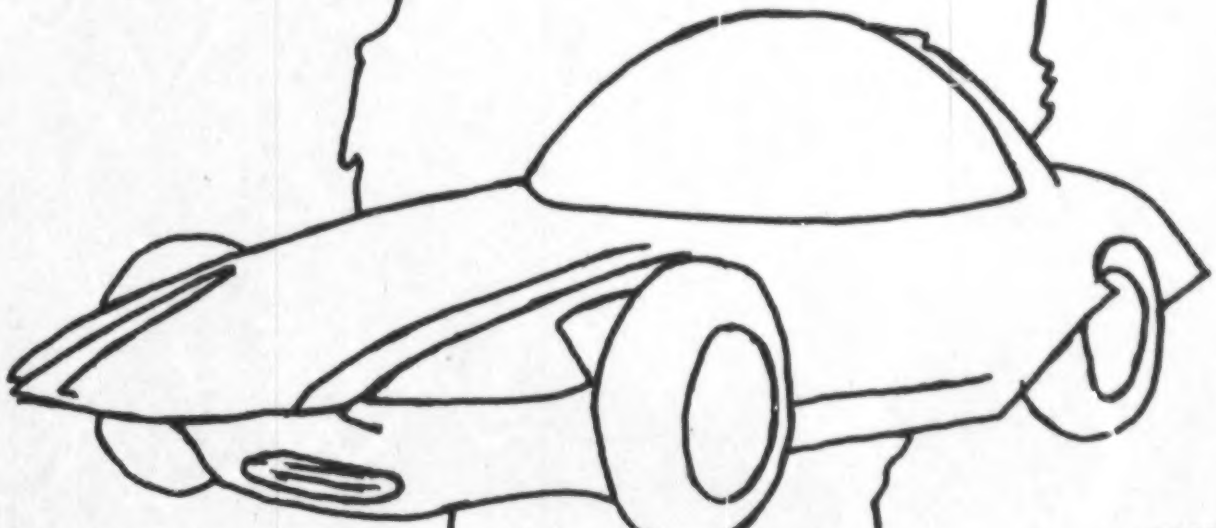
VERMONT

AUTOMOTIVE CURRICULUM GUIDE



AUTOMOTIVE INDUSTRIES
AUTO MECHANICS

CURRICULUM PROJECT
1974-75

VT 102456

TABLE OF CONTENT

	PAGE
INTRODUCTION	1
FOREWORD	2,3
CREDITS	4
SKILL ANALYSIS CHART	5

UNIT		PAGE
I.	ORIENTATION OF SAFETY, TOOLS AND VICA	6
II.	PREVENTATIVE MAINTENANCE	7
III.	TIRES AND WHEELS	8
IV.	EXHAUST SYSTEMS	9
V.	SUSPENSION SYSTEM	10
VI.	BODY ELECTRICAL	11
VII.	CHARGING SYSTEM	12
VIII.	STARTING SYSTEM	13
IX.	ENGINE TUNE-UP	14
X.	STATE INSPECTION	15
XI.	BRAKE SYSTEM	16
XII.	STEERING SYSTEM	17
XIII.	FUEL SYSTEM	18
XIV.	COOLING SYSTEM	19
XV.	ENGINE OVERHAUL	20
XVI.	CLUTCH SYSTEM	21
XVII.	TRANSMISSIONS	22
XVIII.	DRIVE LINES	23
XIX.	DIFFERENTIAL	24
XX.	AUTOMOTIVE ACCESSORIES	25
XXI.	BUSINESS MANAGEMENT	26
XXII.	HUMAN RELATIONS	27

APPENDIX	PAGE
BIBLIOGRAPHY	28
35MM FILM STRIPS	29-33
16MM MOTION PICTURES	34-35
INSTRUCTIONAL METERIAL	36-41
INFORMATION SHEET, VICA	42-50
CHECK SHEET	51
PROGRESS REPORT	52
CRITERION TESTING	53-56
TEACHING METHODS	57
METHODS OF EVALUATION	58
EVALUATION GLOSSARY	59
METHODS GLOSSARY	60-62

CODE	PAGE
UNIT STUDENT SHEET	S-1
UNIT TEACHER SHEET	T-1
RELATED INSTRUCTION	R-1
SHOP JOB SHEET	J-1

INTRODUCTORY STATEMENT

This material has been researched and produced as an instructional System Development Model for Vermont Area Vocational Centers by the Automotive Curriculum Team during a seven (7) week workshop in the summer of 1974. Materials were field tested in selected programs during the 1974-75 school year. A three (3) week finalizing review workshop was held during the summer of 1975.

This material analyzes and organizes a representative series of tasks related to occupations within the Automotive Cluster for a model curriculum guide in the public school vocational program.

This document is made up of a series of units related to tasks identified as, skills, concepts and values, which are stated in behaviorial terms, supported by suggested learning activities, reinforced by teacher resource needs and suggested evaluation criteria or methods.

Additionally the teacher planning document is provided for each unit including, objectives, lesson or unit plan and suggests bibliography of material resources.

Some related sheets and shop job sheets are provided with each unit and are designated by the R-1 for Related and J-1 for Job Sheets.

Instructors will support and are urged to supply the instructional units with additional activities and/or resource materials.

Foreword

Sixteen high schools and area vocational centers in Vermont offer Trades and Industries Automotive Mechanics courses. For the most part, these courses are housed in spacious modern laboratories which are equipped with the latest automotive repair machinery and equipment. The courses are taught by experienced well-qualified instructors who have proven successful in the Automotive Mechanics field.

Ever since Henry Ford made his first automobile, change has been the key word in the automotive field. Each year, the new models coming off the assembly line are different from the previous year's models. They have new safety features, changes in the various systems, more precise adjustments, and added accessories. These changes in the industry make it difficult to keep the Automotive Mechanics courses up to date. The course content, the laboratory equipment, and the textbooks have to be changed often just to keep up with the innovations in the trade. The instructor, too, must adapt to these changes, as he must teach himself new techniques and acquire new skills required to work on the latest automobiles.

The curriculum must be kept up to date if the school is to fulfill its two-fold obligation, (1) to the student and (2) to the industrial community. The first obligation is to prepare the high school student who wishes to become an Automotive Mechanic to enter the field with the attitudes, knowledge and basic skills needed to become a success, or enhance his capability to pursue an advanced program at the post-secondary level. The second obligation is to the industrial community (the establishments who hire Automotive

Mechanic apprentices to ease the current shortage of good mechanics.

The staff of the Vocational Education Media Center, in cooperation with the State Trades and Industries Teacher Educators and a representative group of Automotive Mechanic instructors, has prepared this curriculum guide to benefit the instruction being offered in the Secondary School Automotive Mechanics programs. Those who have worked so diligently to prepare this guide, hope that this publication will be useful in doing the following things:

1. Provide teachers entering the field with guidelines (prepared by a group of experienced teachers) to follow in their first year of teaching.
2. Provide a well thought-out plan of organized material to be taught in the program.
3. Standardize to some extent the objectives and content of the instruction in the various schools across the state, so that when a student transfers to an Automotive Mechanics program in another school, the transition will be easier.
4. Provide sources of instructional materials to use in teaching the various units. Lists of films, filmstrips, textbooks and pamphlets are included.
5. Provide information to school administrators who are comtemplating the establishment of a new Automotive Mechanics program.

INSTRUCTIONAL SYSTEM DEVELOPMENT MODEL FOR VERMONT AREA VOCATIONAL CENTER
HARTFORD AREA VOCATIONAL CENTER

Instructors 7 weeks July 1-August 16, 1974
Instructors 3 weeks June 30-July 16, 1975

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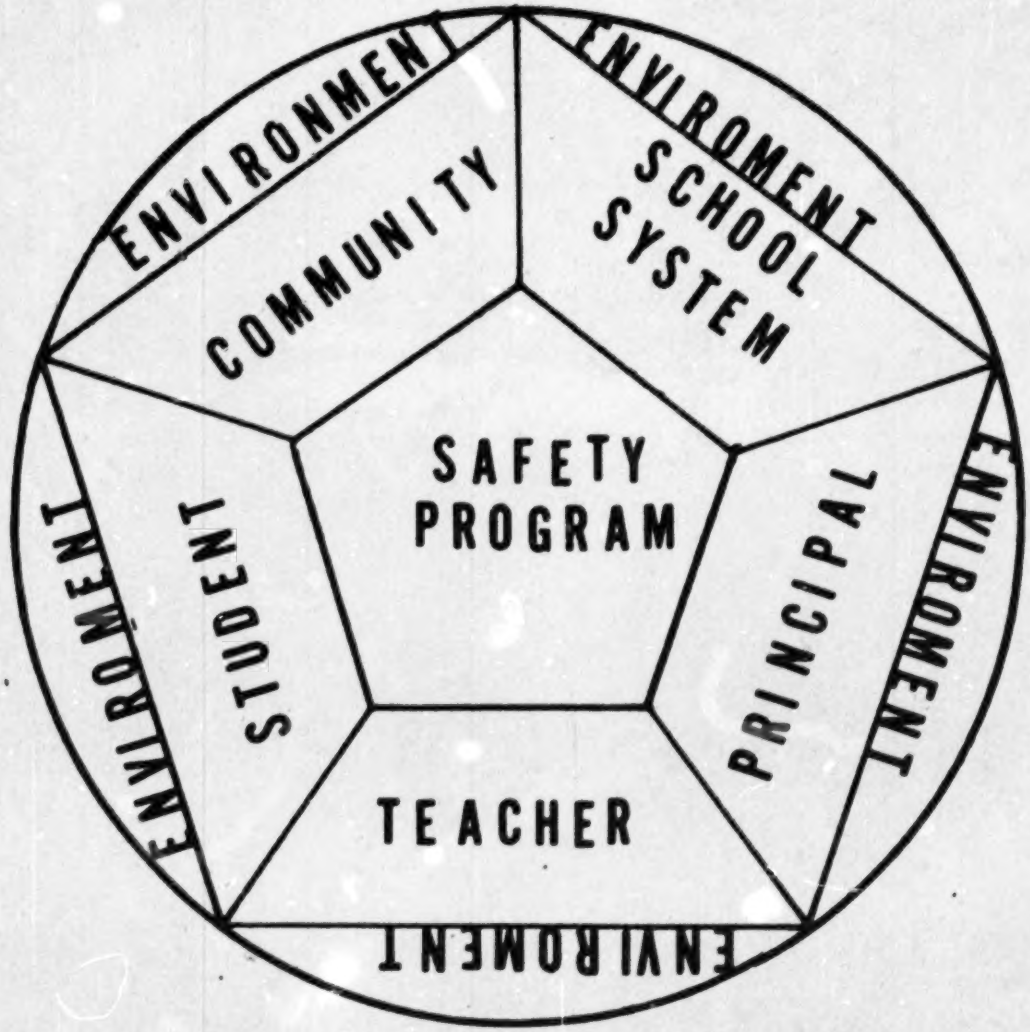
SKILL ANALYSIS CHART FOR:

AUTOMOTIVE MECHANICS

R= REQUIRED
O= OPTIONAL

OCCUPATION D.O.T. NUMBER	Orientation and Shop Safety	Related Theory	Preventive Maintenance	Tires and Wheels	Exhaust System	Suspension System	Body Electrical	Charging System	Starting System	Engine Tune-up	State Inspection	Brake System	Steering System	Fuel System	Cooling System	Engine Overhaul	Clutch System	Transmissions	Drive Line	Differential	Auto Accessories	Business Management	Human Relations
Service Stat. Att. 915 867	R	R	R	R	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	R	
Car Washer 915 867	R	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	R	
Pump man 915 867	R	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	R	
Lubrication man 915 867	R	R	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	R	
Tire repair man 915 867	R	R	R	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	R	
Service Stat. Mech. 620 381	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	O	O	O	O	O	O	R	R
Front End Man 620 381	R	R	R	R	R	R	O	O	O	O	R	O	R	O	O	O	O	O	O	O	O	O	R
Tune-up man 620 381	R	R	R	R	R	R	R	R	R	R	O	O	O	R	R	O	O	O	O	O	O	O	R
Brake Man 620 381	R	R	R	R	R	R	O	O	O	O	R	R	O	O	O	O	O	O	O	O	O	O	R
Apprentice Mechanic 620 281	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Electrician 620 281	R	R	R	R	R	R	R	R	R	R	O	O	O	O	O	O	O	O	O	O	O	O	R
Transmission Mechanic 620 281	R	R	R	R	R	R	O	O	O	O	O	O	O	O	O	O	R	R	O	O	O	O	R
Engine Overhaul Mech. 620 281	R	R	R	R	R	R	O	O	O	O	O	O	O	O	O	R	O	O	O	O	O	O	R
Air Conditioning Mech. 620 281	R	R	R	R	R	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O	R	O	R
Parts man 223 387	R	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	R	R

THE ROLE OF SCHOOL SAFETY



SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
I. ORIENTATION AND SAFETY			Explain the use of DOT.	
1. The automotive mechanic should know the job opportunities and job requirements in order to prepare him for profitable employment in the automotive field.	1. Given the proper instructions, the student will write about three job opportunities.	1. Write a paper on three automotive trade occupations.	1. Set standards for writing of paper.	1. Write a paper.
		2. Complete written assignment on tools.	2. Prepare written assignment on tools.	
2. The practice of safe working habits are important when working with tools and equipment.	2. Use and operate tools and equipment to meet the course requirements and the safety rules to follow when working in a shop.	3. The class will list the safety rules discussed on paper.	3. Discuss the proper way to store and dispose of flammable materials.	2. Written test on shop safety.
		4. Following demonstration: a. Place car on lift. b. Place car on jack stands. c. Demonstrate the proper use of power equipment.	4. Demonstrations: a. Proper use of lifts, jacks, safety stands and vises. b. Proper way to use power tools. c. Proper way to use compressed air. d. Proper use of hand tools.	3. Demonstrate proper use of specified equipment and hand tools assigned by teacher.
		5. Apply all safety rules.	5. Invite Cooperative Coordinator to speak.	4. Pass all skills.
		6. Work experience in the trade.		

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
I. ORIENTATION AND SAFETY		
1. Show enthusiasm in a job in the automotive field by attention to discussion in class and cooperation with fellow classmates and teacher.	1. Discuss the job opportunities in the automotive field.	Dictionary of Occupational Titles (DOT) **Auto Mechanics Fundamentals, by Stockel**
2. Show an interest in the objectives of the automotive course by attendance in class and the completion of all required assignments.	2. Review objectives of automotive course.	Curriculum Guide pp. 3-7 **Auto Service and Repair, by Stockel**
3. Develop a positive attitude to follow shop regulations by their practice in shop.	3. Review class and shop policies and regulations.	Teacher's Handbook
4. Develop a positive attitude toward practice of shop safety by following all safety rules.	4. Present list of shop safety rules.	McGraw-Hill, Inc. Care and Maintenance of Tools (Film) Shop Safety (Film)
5. Display an interest in the proper use of tools and equipment when using them in the shop.	5. Demonstrate proper use of tools and equipment.	**General Motors -** **ABC of Hand Tools (film)**
	6. Write a paper on three automotive occupations.	Teacher made tests - **Basic Tools**
	7. Written test on shop safety.	

Cooperative Education

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION MEASURES
Cooperative Education Cooperative education is part of the total program. It allows the student the opportunity to obtain on-the-job experience in the occupation of his/her choice. NOTE: There are steps which must be completed prior to being placed in a work station. These are covered through the planned curriculum for cooperative education. This section would be applicable when the instructor is ready to introduce Co-op. The producers of this document suggest early and continuous cooperation with the Co-op Coordinator. Refer to General Related Occupational Instruction Guide 1975 - Vermont Dept. of Education Votec Division	Students placed in a co-op situation will perform their duties to the satisfaction of their employer, co-op coordinator and instructor.	Training experience in an automotive facility	Team-teaching unit developed by the co-op coordinator and instructor with the assistance of the employer. Automotive facilities - job descriptions.	Evaluation by employer, co-op coordinator, and instructor.

Cooperative Education

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
Co-operative Education Perform skills for job assigned as given by employer, co-op coordinator, and instructor.	Provide preparation for the job in which placed through Cooperative Education.	Team-teaching units developed by co-op coordinator and instructor. Job descriptions from automotive facilities.

Unit I ORIENTATION CON'T.

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION MEASURES
VICA 1. One should have an understanding of the process of decision making. 1. Recognize the need to make decisions. 2. Understand possible alternatives. 3. Understand probable consequences. 4. Understand varying factors of influence. 5. Make a tentative choice. 6. Take action. 7. Evaluation. 2. VICA is a volunteer youth organization for students in vocational programs. Students may derive experience in leadership, character building ,proper work attitudes and interpersonal relationships.	1. Given the proper instruction on decision making through the 7-step process the student should be able to write a short statement describing reasons for joining or not joining VICA.	1. List the pro's and con's on paper and make a decision. 2. Watch film. Discuss organization including emblem. 3. Use a resource person, student member.	1. Instructor will lead discussion on decision making using the 7 step process. 2. VICA banner VICA emblem Leader handbook Craftsmanship/leadership handout Film - VICA	1. Write essay.

Unit I ORIENTATION CON'T.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
VICA 1. List the 7 steps in decision making process 2. Give reasons for joining or not joining VICA.	1. Lead discussion on the 7 step process. 2. Show film on VICA. Discuss organization. Perform emblem ceremony, and explain significance of each step. Discuss leadership, character building, proper work attitudes and interpersonal relationships training, offered by organizations.	2. Film on VICA. VICA banner VICA emblem Leader handbook Craftsmanship/leadership worksheets

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Orientation
SUB – UNIT :	Introduction
PERFORMANCE OBJECTIVE NO. :	I
TITLE :	Introduction to Auto Course

RESOURCES :
1. Lecture notes
2. Text book
3. Film list
4. Safety test

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. Class attendence	1. Lecture	1. Student must be in class.
2. Recieve text book	2. Text books: <u>Auto Mechanics Fundamentals</u> <u>Auto Service and Repair</u>.	2. Reading Assignment pp. 449-456
3. View films	3. Film: <u>Auto Biography</u> <u>Shop Safety</u>	3. Safety test to be filed.

117

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Tools

SUB-UNIT: Hand tools

PERFORMANCE OBJECTIVE NO. I

TITLE: Tool Identification and Use

RESOURCES:

1. Open tool boards
2. Tool check sheets

ACTIVITY

1. Select tool boards and identify each tool, its' use and proper care.

2. Boards available:
   A. Screw drivers
   B. Hammers
   C. Chisels and punches
   D. End and comb. wrenches
   E. Pliers
   F. Hacksaws and files
   G. Socket and handle sets

EVALUATION:

To be able to identify all automobile mechanics tools, use and care.

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Tools

SUB UNIT: Measuring

PERFORMANCE OBJECTIVE NO.: I

TITLE: Use of Measuring Tools

RESOURCES:

1. Service manual
2. Set of micrometers
3. Set of telescope gauges
4. Dial indicator set
5. Thickness gauge set

ACTIVITY

1. Measure parts supplied for correct size to meet manufactor's specifications.

   a. Part outside diameter
   b. Part inside diameter
   c. Part side clearance
   d. Part end gap
   e. Part run out

EVALUATION:

To be able to measure part to determin if they meet manufactor's specifications.

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Tools

SUB UNIT: Special Tools

PERFORMANCE OBJECTIVE NO: I

TITLE: Special Tool Identification and Use

RESOURCES:

1. Special tool boxes
2. Tool check sheets

ACTIVITY

1. Open tool boxes and identify each tool, its' use and proper care.
2. Tool boxes available.
   A. Twist drills
   B. Tops and dies
   C. Screw extractors

EVALUATION

To be able to identify all automobile mechanics special tools, use and care.

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Orientation

SUB-UNIT Introduction

PERFORMANCE OBJECTIVE NO.: I

TITLE: Introduction to Auto Course

RESOURCES: The instructor will approach the student and welcome him to the Auto Course. Create a discussion about general topics.

1. Course outline
2. Hand-out sheet rules on shop
3. Explain shop safety

ACTIVITY After related instruction proceed as follows:

1. Instructor conducts tour of Auto shop.
2. Instructor explains to student what is expected of him and how he is to conduct himself in the Auto shop.
3. The student observes all phases of the training being conducted in the shop.
4. Instructor explains opportunities of the trade.
5. Instructor will explain procedure for checking out tools.
6. Instructor will explain how shop clean up is done.

EVALUATION:

No performance criteria.

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Tools
SUB – UNIT :	Hand Tools
PERFORMANCE OBJECTIVE NO. :	I
TITLE :	Tool identification and use

RESOURCES :
1. Tool film
2. Film quiz
3. Text book
4. Tool test

ACTIVITY (STUDENT)

1. View film
   Identify selected group of hand tools

   Demonstrate safe way to handle tools.

REFERENCE :

1. ABC of Hand Tools
2. Auto Service and Repair
   Chapter 1, pp. 1-24
   Auto Mech. Fund.
   Chapter 21, pp. 425-446
3. Film: "ABC of Hand Tools"

EVALUATION :

1. Film quiz
2. Written Assignment:
   pp. 1-24 Q. 1-41
   Written Assignment:
   pp. 446-447
   questions 1-36

Test Content

Tool construction
Use of tools
Tool Safety practice
Care of tools

22

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Tools
SUB – UNIT :	Measuring
PERFORMANCE OBJECTIVE NO. :	I
TITLE :	Use of Measuring Tools

RESOURCES :

1. Text book
2. Set of mics. 1-4"
3. Thickness gauges
4. Wire gauges
5. Steel scales
6. Dial indicator
7. Telescope gauges
8. Inside micrometer
9. Engine parts to measure

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. Measure parts and record measurement.	1. Auto Service and Repair. Chapter 2, pp. 1-12	1. Written Assignment: p. 12, Questions 1-8
2. Activity Sheet: Precision Measuring Tools		Test Content Tool identification Tool care Measuring practice

23

PREVENTATIVE MAINTENANCE

WHEEL ALIGNMENT

- ☐ Idler Arm
- ☐ Ball Joints
- ☐ Tie Rod Ends
- ☐ Others

BRAKES

- ☐ Adjustment
- ☐ Lining
- ☐ Drums

EXHAUST SYSTEM

- ☐ Mufflers
- ☐ Pipes

SHOCK ABSORBERS

- ☐ Front
- ☐ Rear

ELECTRICAL & LIGHTS

- ☐ Battery
- ☐ Cables
- ☐ Horn
- ☐ Head Lights
- ☐ Tail Lights
- ☐ Directional & Brake

VISION

- ☐ Glass
- ☐ Wipers

FLUID

- ☐ Radiator
- ☐ Battery
- ☐ Brakes
- ☐ Power Steering
- ☐ Crankcase
- ☐ Transmission
- ☐ Rear End

☐ SEAT BELTS

TIRES

- ☐ Front
- ☐ Rear

UNIT II

PREVENTATIVE MAINTENANCE

1. Check Lubrication

2. Check Fluid

3. Check for Worn Parts

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
II. PREVENTIVE MAINTENANCE				
1. Anyone employed in the Auto Mechanic field, from the simplest to the most complex occupation, should be aware of the importance to practice preventative maintenance to prolong the life of the vehicle.	1. Given a preventative maintenance check sheet, the student will perform a maintenance check on a prescribed vehicle listing all needs on the check sheet in their proper place.	1. Observe a teacher demonstration on the proper way to perform preventive maintenance check sheet. 1A. Perform a preventive maintenance check. This should include: a. Chassis lubrication b. Pack front wheel bearings c. Check for worn front end parts d. Check universal joints e. Lubricate all hinges and latches f. Check all fluid levels: 1. Gear box 2. Engine 3. Battery 4. Radiator 5. Master cyl g. Follow all safety standards	1. Demonstrate use of lubrication guide. (Use any petroleum lubrication guide.) * Teacher-made preventative maintenance check sheet. 2. Demonstrate the proper procedure used in performing a preventive maintenance check sheet. * Sample check sheet in appendix.	1. Pencil quiz. 2. Use check list on preventive maintenance.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
II. PREVENTIVE MAINTENANCE		
1. Can determine meaning of terms on check list.	1. Present instruction on preventive maintenance.	1. Use any petroleum lubrication guide.
2. Communicate defects as determined by check list.	2. Demonstrate use of check list.	2. Car Service by Chek-Chart.
3. Use check list accurately.	3. Pass out and discuss maintenance check list.	Film: Cure The Cause - by Chrysler 71 .
4. Will perform preventive maintenance check.	4. Prepare paper and pencil quiz.	
	5. Collect and grade check list.	

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Preventive maintainance
SUB – UNIT :	Safety Inspection Check List
PERFORMANCE OBJECTIVE NO. :	II
TITLE :	Preforming a Safety Check

RESOURCES : Hand out safety inspection check list to each student.

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
Record customer information on check list.	Safety Inspection Check List Customer name Customer address Customer phone Car model Mileage License Number	Completion of Check List.

28

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Preventative Maintenance

SUB-UNIT: Safety Inspection Check List

PERFORMANCE OBJECTIVE NO.: II

TITLE: Performing a Safety Check

RESOURCES:

1. Assign vehicle to be checked.
2. Hand out check list sheet.
3. Demonstrate proper procedures.
4. Safety steps to be taken.

ACTIVITY. After satisfactory completing related theory proceed as follows:

1. Student will observe demonstration by instructor.
2. Receive Safety Check List and enter all owner information properly.
3. Put on safety glasses.
4. Place vehicle on lift.
5. Perform all safety check as listed on check list.
6. Explain to instructor all suggested repairs.
7. Observe all safety regulations.
8. Receive approval from instructor on this Sub-Unit. If not approved repeat safety check on vehicle.
9. If approved on this Sub-Unit proceed to next Sub-Unit.

EVALUATION:

To be proficient in safety check of vehicle.

J-1

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Preventative Maintenance

SUB-UNIT: Chassis Lubrication

PERFORMANCE OBJECTIVE NO.: II

TITLE: Lubricating to Chassis

RESOURCES:

1. Assign vehicle
2. Issue job sheet
3. Class demonstration
4. Safety precautions

ACTIVITY. After completing the related theory section proceed with the following:

1. Draw seat cover from tool crib.
2. With seat cover in place, move vehicle into work area.
3. Raise vehicle on hoist, and observe all safety rules.
4. Wipe all grease fittings with a clean cloth.
5. Grease each fitting.
6. Check where fittings are located in a lubrication guide.
7. Check gear box fluid levels.
8. Lower vehicle.
9. Check water in battery.
10. Check fan belt.
11. Check radiator level.
12. Check brake master cylinder.
13. Make out milage sticker.
14. Have job checked by instructo..
15. Place vehicle in proper area.
16. Clean work area for next job.

EVALUATION:

A perscribed in the Chassis Lub. Guide and to meet instructors standards.

J-2

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Preventative Maintenance

SUB-UNIT: Front Wheel Bearings

PERFORMANCE OBJECTIVE NO.: II

TITLE: Packing Front Wheel Bearings

RESOURCES:

1. Assign vehicle
2. Issue job sheet
3. Demonstrate to student
4. Point out safety precautions

ACTIVITY: After satisfactory completion of related theory proceed as follows:

1. Draw seat cover from tool crib.
2. With seat cover in place, bring vehicle into work area.
3. Raise vehicle on lift, observing all safety measures.
4. Draw tools from tool crib.
5. Remove hub cap.
6. Remove bearing dust cap.
7. Extract cotter pin.
8. Remove nut from spindle.
9. Remove washer and outside wheel bearing.
10. Install nut on spindle.
11. Remove wheel assembly allowing nut on spindle to remove inner wheel bearing.
12. Wash wheel bearings in solvent.
13. Remove old grease from hub and clean it.
14. Pack inner wheel bearing and place in wheel hub.
15. Install grease seal being careful not to get grease on Drum.
16. Place wheel back on spindle.
17. Pack front wheel bearing, install and adjust.
18. Replace new cotter pin, install dust cover and hub cap.
19. Pick up and clean all tools.
20. After inspection by instructor, lower vehicle and replace in proper area.

EVALUATION:

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Preventative Maintenance

SUB UNIT: Clutch free travel

PERFORMANCE OBJECTIVE NO. II

TITLE: Procedure for checking and adjusting

RESOURCES:

1. Assign vehicle
2. Issue Job sheet
3. Demonstrate to student
4. Safety precautions

ACTIVITY: After passing related theory, proceed with the following:

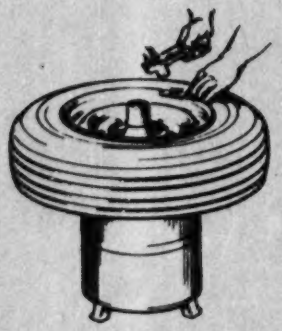
1. Draw seat cover from tool crib
2. With seat cover in place, move vehicle into work area
3. Check clutch peddle free play by depressing clutch peddle with toe to just take up the slack. The peddle should move about 3/4".
4. If not satisfactory the clutch must be adjusted as follows:
   a. Raise car on hoist
   b. Adjust the link between the clutch arm and the clutch fork
   c. Lock the locking nut
   d. Lower vehicle
5. Set emergency brake, place shift lever in high, with motor running about 20 MPH, engage clutch and motor should stop.

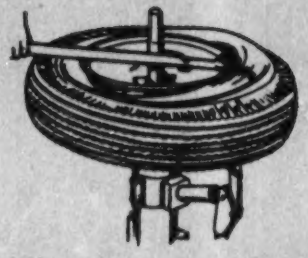
EVALUATION:

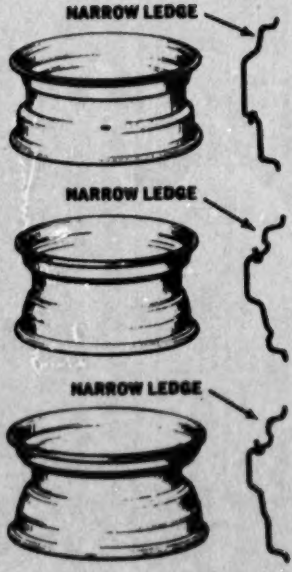
Complete as perscribed by the instructor

J-4

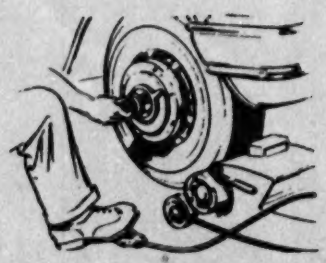
TIRES

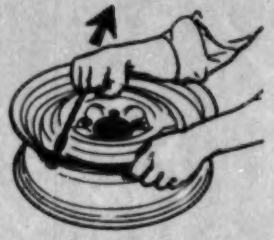






WHEEL





UNIT III

TIRES AND WHEELS

1. Tire Service
2. Wheel Balancing
3. Wheel Alignment

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
III. TIRES AND WHEELS				
The wheels of an automobile are one of the largest areas of sales and service in the industry which makes it necessary for the Automobile Mechanic to know how to change, balance and align wheels.	Given an automobile, the student will change the tires, balance all wheels and align to meet manufacturer's specifications.	1. Complete a written assignment on tires and wheels. 2. Following demonstration: a. Jack up car and remove a wheel. b. Remove tire from rim and replace with new tire. c. Balance wheel. d. Check wheel alignment and correct to manufacturer's specification.	1. Prepare a written assignment from texthook. 2. Demonstration: a. Safe way to jack car to remove wheel. b. Proper use of tire changer. * c. Correct way to balance a wheel. * d. Proper way to operate wheel alignment equipment.	Written test on tires and wheels. Jack up car and change one wheel. Balance one wheel. Align front end to meet manufacturer's specifications

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
III. TIRES AND WHEELS		
1. Jack vehicle using safety standards.	1. Support learning situation with proper instruction and/or demonstration.	1. Auto Mechanics - Crouse Automotive Fundamentals - Stockel Car Service - Chek-Chart
2. Safely use auto hoist.	2. Demonstrate proper way to use tire machine.	2. Coats Company Operating Manual Bishman Operating Manual
3. Proficient in use of tire changer.	3. Correct way to balance a tire a. Bubble balance b. Off car spin balance c. On car spin balance	3. Bear Company Operating Manual Bean Company Operating Manual Snap-on Company Operating Manual
4. Check wheel alignment.	4. Instruction on proper setup and operation of front end equipment.	4. Bear Company Operating Manual Bean Company Operating Manual Snap-on Operating Manual
5. Accurately identify front end parts by proper names.	5. Prepare test.	5. **Auto Service and Repair by Stockel** **Film: Tire Care for Safety by Car Education Institute** **Tire Problem Analysis by Ford**
6. Will identify worn and defective parts.	6. Assign vehicle to student for proficiency test.	

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Tire and Wheels
SUB – UNIT :	Rotation of Tires
PERFORMANCE OBJECTIVE NO. :	III
TITLE :	Tire Mileage Service

RESOURCES :
1. Film list
2. Film quiz
3. Text book
4. Hand out tire rotation
5. Car Care Guide

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View film	1. Film: Tire Care for Safety	1. Film quiz
2. Record rotation pattern for two specific automobiles	2. Auto Mech. Fund. Chapter 16, pp. 304-305	2. Written Assignment: p. 305. Q. 20-25
3. Practice tightening sequence	3. Auto Service and Repair. Chapter 30, p. 20	3. Written Assignment p. 29, Q. 1-35

Test Content

1. Tire wear
2. Rotation pattern
3. Tightening sequence

37

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Tires and Wheels

SUB-UNIT: Rotation of tires

PERFORMANCE OBJECTIVE NO.: III

TITLE: Procedure of Tire Rotation.

RESOURCES:

1. Recommendations of procedure
2. Recommended rotation patterns
3. Assign vehicle for tire rotation
4. Safety procedures to follow

ACTIVITY: After completing related lessons proceed as follows:

1. Place seat cover in vehicle.
2. Place vehicle in work area.
3. Raise vehicle with jack, using safety stands or with lift.
4. Decide tire rotation pattern.
5. Draw 4-way wrench from vehicle.
6. Remove spare tire.
7. Remove wheels from vehicle.
8. Rotate tires to confirm to pattern decided on.
9. Reinstall wheels on vehicle.
10. Check all lug nuts for tightness.
11. Have instructor inspect before installing hub caps.
12. Install hub caps.
13. Install spare tire.
14. Observe all safety rules.
15. Replace everything in trunk.
16. Place day in finished area.
17. Remove and replace seat cover in proper place.
18. Return tools to tool crib.
19. Clean area for next assignment.

EVALUATION

To be able to rotate tires efficiently and safely to meet instructors standards.

AUTOMOTIVE SYSTEMS

EXHAUST & EMISSIONS

UNIT IV

EXHAUST SYSTEM

1. Exhaust pipe replacement
2. Muffler replacement
3. Hanger replacement
4. Emission Controls

UNIT	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION MEASURES
IV EXHAUST SYSTEM A. Exhaust Systems 1. Exhaust systems are vital to the health and safety of the vehicle occupants and to deaden noise level. 2. Exhaust fumes are deadly. B. Emission Controls 1. Emission controls are a vital part of the ecology program. They should be serviced periodically and properly.	A. 1. Given an automobile, the student will inspect, list parts needed and install new parts in vehicle exhaust system. 100% no leaks. B. 1. Assigned an automobile, the student will service, replace or adjust to 100% accuracy according to manufactures specification.	A. 1. Attend lecture and view demonstration on auto exhaust systems. 2. Assignment: Submit chapter questions. 3. Inspect the exhaust system on a given vehicle to meet instructor's standards. 4. Replace all defective parts in the exhaust system to meet instructor's qualifications. 5. Apply all safety standards. B. 1. Attend related class on emission controls and view demonstration by instructor. 2. Assignment: Submit chapter questions. 3. Inspect and adjust emissions controls to meet manufactor's specifications. 4. Replace all parts which do not meet manufactor's specifications.	A. 1. Present instruction on inspections and repair of the auto exhaust system, followed by a demonstration. 2. Set standards on exhaust system inspection. 3. a. Set qualifications for replacing parts of the auto exhaust systems. b. Never repair defective parts in the exhaust system. Always install new parts. c. Exhaust fumes are deadly. B. 1. Repeat above as pertains to emissions controls.	A. 1. Pencil test on the auto exhaust system. 2. Check list on the learning activities. B. 1. Pencil test on the emission control system. 2. Check list on leaning activities.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
IV. EXHAUST SYSTEMS		
1. Identify parts by proper terminology.	1. Instruction pertaining to terminology and procedures used on the exhaust system.	Auto Mechanics - Crouse
2. Place vehicle on hoist.	2. Assign vehicle to student.	Automotive Fundamentals - Stockel
3. Determine parts needed and order.	3. Purchase parts.	Car Service - Chek-Chart
4. Install new parts.	4. Check proficiency of work done and grade.	Film: Emission Control - Ford Evaluation of a Clean Air System - Chrysler Auto Service and Repair by Stockel
5. Test system.	5. Prepare test.	

RELATED INSTRUCTION

PROGRAM : Auto Mechanics
UNIT : Exhaust System
SUB – UNIT : Exhaust System
PERFORMANCE OBJECTIVE NO. : IV
TITLE : Exhaust System Construction

RESOURCES : 1. Textbook

2. Booklet: A.P. Muffler

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
Class discussion on purpose of exhaust system.	Auto Mechanics Fundamentals - Chapter 6, p. 146 Auto Service and Repair - Chapter 33, pp. 1-7	Written Assignment: p. 16 Questions 1-16 Test Content: 1. Exhaust system design. 2. Exhaust system construction. 3. Exhaust system service.

43

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Exhaust System

SUB-UNIT: Exhaust Manifold

PERFORMANCE OBJECTIVE NO.: IV

TITLE: Install Exhaust Manifold Flange Gasket

RESOURCES:

1. Assign shop engine
2. Issue new gasket
3. Issue job sheet
4. Explain torque wrench
5. Safety procedures to follow

ACTIVITY: After completion of related theory proceed as follows:

1. Select wrenches needed
2. Remove flange and engine pipe
3. Remove all of old gasket
4. Check gasket for correct size and fit
5. Install new gasket
6. Install pipe and flange
7. Tighten only to specific torque
8. Start engine and check for leaks
9. Be checked out by instructor
10. Practice all safety rules
11. Replace tools
12. Clean area
13. Turn in job sheet
14. Proceed to next unit

EVALUATION:

Student will perform skill to instructors standards.

J-1

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Exhaust System

SUB-UNIT: Muffler replacement

PERFORMANCE OBJECTIVE NO.: IV

TITLE: Install muffler in assigned vehicle

RESOURCES:

1. Motors Manual
2. Auto Service and Repair
3. Tools
4. Safety Procedure

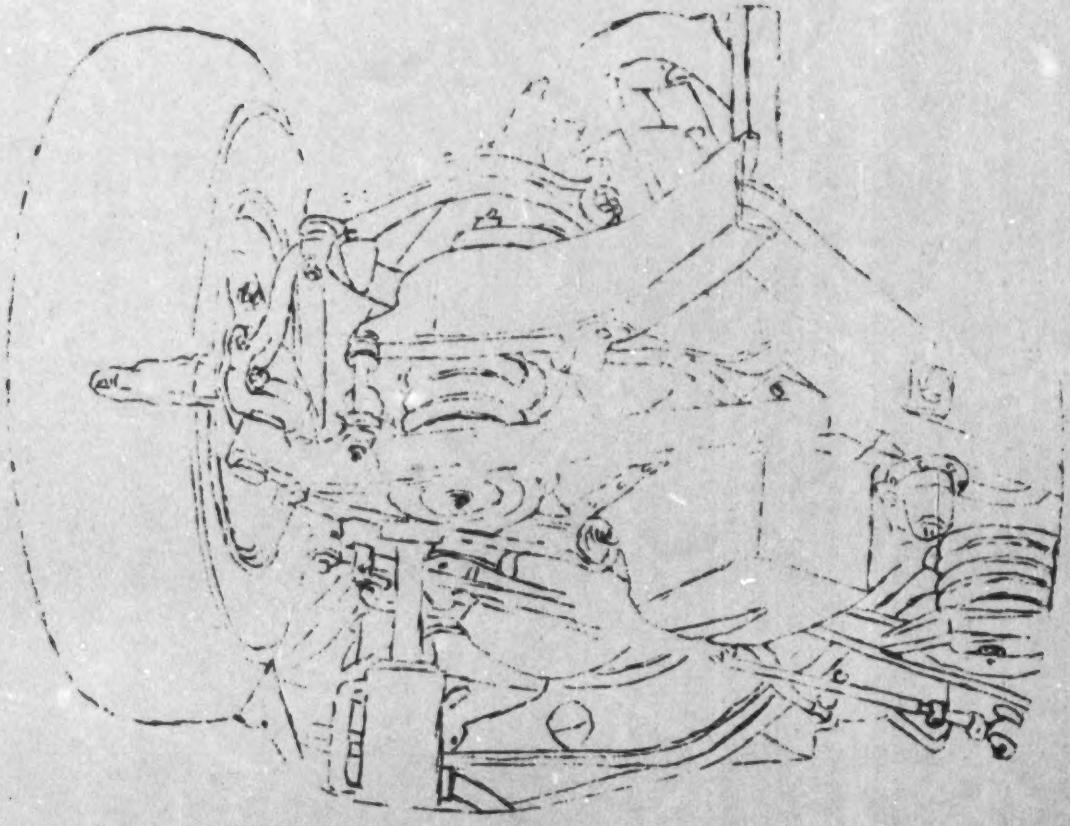
ACTIVITY After completing related theory proceed with the following:

1. Place vehicle on lift.
2. Select tools needed.
3. Remove front and rear muffler clamps.
4. Drop tailpipe hangers to allow room to remove muffler.
5. Cut muffler outlet pipe off close to muffler with muffler gun.
6. Cut back inlet pipe on muffler.
7. Remove old muffler.
8. Cut outlet piece out of tailpipe.
9. Install new muffler.
10. Test for leaks.
11. Clean tools.
12. Lower vehicle and in proper area.
13. Remove seat cover.
14. Clean work area.
15. Proceed to next sub-unit.

EVALUATION:

To meet instructor's standards.

SUSPENSION



UNIT V

SUSPENSION SYSTEM

1. Types of springs
2. Shock Absorbers
3. Independent suspension

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
V. SUSPENSION SYSTEM				
1. The automobile mechanic should understand that the suspension system supports the automobile body and frame to absorb road shock which affects the ride and handling.	1. Given an automobile, the student will check suspension system to determine if it is the cause of tire wear and replace any parts to correct the condition to meet manufacturer's specifications.	1. Read assigned chapter on suspension system and answer quiz questions.	1. Prepare a reading and written assignment from textbook.	1. Written test on the suspension system.
		2. View teacher demonstration: a. Place car on jacks to check suspension. b. Check springs for defects. c. Remove and replace a tie rod end and check wheel alignment. d. Remove and replace a ball joint and check wheel alignment.	2. Demonstrations: a. How to place car on jacks to check suspension system. b. How to check springs for defects. * c. Proper way to replace a shock absorber. * d. How to replace a tie rod end and make adjustments. * e. How to replace a ball joint and make adjustments.	2. Place a car on jack and check suspension system for worn parts and replace them to meet manufacturer's specifications.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
V. SUSPENSION SYSTEM		
1. Identify types of tire wear.	1. Show slides on tire wear patterns and discuss.	Slides on front end: Bear Company Jam Handy McGraw-Hill
2. Test shocks for wear.	2. Show slides on proper procedure in checking suspension.	Motors Manual - Motors Inc.
3. Check ball joints.	3. Assign vehicle.	Factory Specification Book - Dealer
4. Order parts needed.	4. Review safety procedures.	**Auto Mechanics Fundamentals by Stockel**
5. Replace new parts.	5. Prepare test.	**Auto Service and Repair by Stockel**
6. Check alignment.	6. Grade student on proficiency of work.	**Film: Conventional Steering and Suspension by Ford**

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Suspension System
SUB – UNIT :	Ball Joints
PERFORMANCE OBJECTIVE NO. :	V
TITLE :	Ball Joint Operation and Service

RESOURCES :
1. Textbook
2. Film List
3. Suspension Training Aid

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. Class discussion on suspension.	Auto Mechanics Fundamentals - Chapter 15, pp. 275-295	Written Assignment: P. 295 Questions 1-35
2. View Film.	Film: "Suspension Service"	
3. Practice suspension operation on Training aid.	Auto Service and Repair - Chapter 31, pp. 23-28	Written Assignment: p. 41, Questions 25-32

Test Content:

1. Ball Joint Operation
2. Ball Joint Construction
3. Ball Joint Service

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Suspension

SUB-UNIT: Ball Joints

PERFORMANCE OBJECTIVE NO. V

TITLE: Inspect Ball Joints for Wear

RESOURCES:

1. Assign vehicle
2. Assign job sheet
3. Demonstrate methods of jacking
4. Emphasize safety

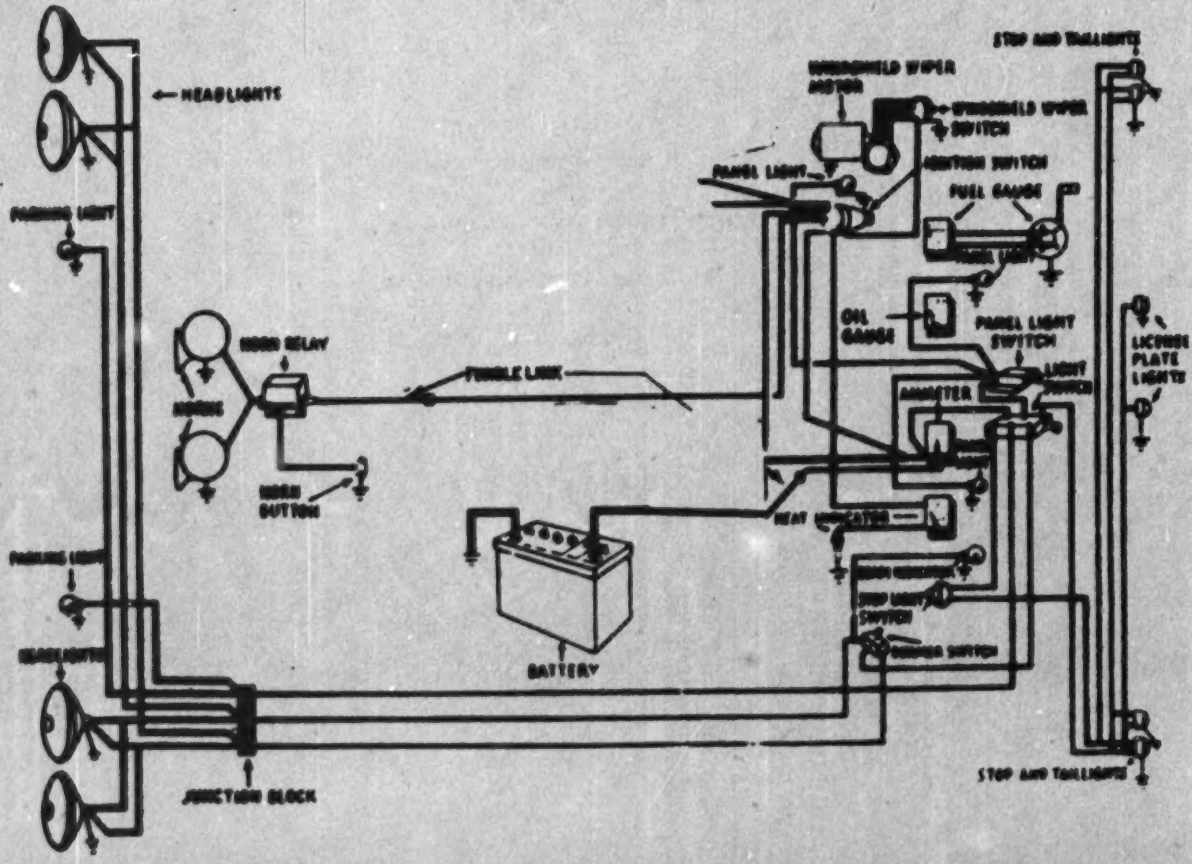
ACTIVITY After completing related theory proceed with the following:

1. Place seat cover on vehicle.
2. Place vehicle in work area.
3. Jack or raise vehicle in the proper manner.
4. Determine wheither loose play.
5. Record findings on work order.
6. Apply all safety rules.
7. Pick up tools.
8. Place vehicle in proper area.
9. Remove seat cover and put in proper place.
10. Clean area for next assignment.

EVALUATION:

The student will inspect ball joints according to shop manual learning time 1-hour.

BODY ELECTRICAL



UNIT VI

BODY ELECTRICAL

1. Lighting system
2. Windshield wipers
3. Heating and ventilating
4. Air Conditioning

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
VI. BODY ELECTRICAL 1. Body electrical covers a wide variety of items on the automobile. It is imperative that the mechanic know these items by location and how to service them.	1. Assigned a vehicle, the student will locate and repair deficiencies in the auto body electrical system according to S.A.E. standards.	1. Attend lecture and hands on demonstration on the auto body electrical training and in the class room, consisting of lights, signals, gauges, wiring harness, air conditioning, and heating and ventilating; also, trouble shooting and safety procedures. 2. Complete written assignment on Electrical Fundamentals and Service. 3. Search out and list parts needed to correct malfunctions and install or repair any item listed in Activity. 4. Apply all safety procedures.	1. Present instruction on body electrical service and diagnosis of deficiencies, followed by a hands on demonstration on the body electrical training aid. 2. Prepare written assignment on Electrical Fundamentals and Service. 3. Give student vehicle with several electrical deficiencies (either real or man-made deficiencies). 4. Give students new parts or material needed to correct deficiencies.	1. Pencil test on body electrical. 2. Inspect repairs made and make recommendations and grade.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
VI. BODY ELECTRICAL 1. Check all body electrical units consisting of: a. Lights b. Signals c. Gauges d. Wiring harness e. Air conditioning f. Heating g. Ventilating 2. Report parts needed. 3. Repair or replace any malfunctions.	1. Present basic electricity theory. 2. Discuss circuits and circuitry. 3. Demonstrate proper test equipment and procedures. 4. **Lighting Demonstrator Unit Worksheet.** 5. Assign vehicle with problem. 6. Hand out unit work sheet. 7. Prepare test. 8. Review safety procedures.	Automotive Electrical Systems - Auto Electrical Association **Auto Mechanics Fundamentals by Stockel** Automotive Encyclopedia - Motors Auto Engines and Electrical Systems - Harold E Blanchard **Automobile Lighting Demonstrator A-100 - Brodhead-Garrett** **Auto Service and Repair - Stockel** **Film: Introduction To The Auto Electrical System - Delco-Remy** **Fundamentals of Electricity - Ford** **Electrical Wiring 68 - Chrysler** **Electric Power for Safety-Car Education Institute** **It's Easy to be an Expert - Delco-Remy**

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Body Electrical
SUB – UNIT :	Lighting
PERFORMANCE OBJECTIVE NO. :	VI
TITLE :	Fundamentals of Electricity

RESOURCES :
1. Film List
2. Textbook
   Wiring Diagram
3. Wiring supplies for soldering practice
4. Light Wiring Simulator

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View film.	Film: "Electrical Wiring" "Fundamentals of Electricity"	
2. Color code light wiring diagram.	Auto Mechanics Fundamentals - Chapter 19, pp. 363-370 and pp. 398-405	Written Assignments: p. 405, Questions 1-23, 67-74
3. Practice soldering wire connections.	Auto Service and Repair - Chapter 6, pp. 1-12	Written Assignment: p. 12 Questions 1-38
4. Wire up lights on simulator.	Demonstrate use of light simulator	
5. Test light circuits on auto lighting demonstrator.	Work sheet for Auto lighting demonstrator	Test Content: 1. Electrical fundamentals. 2. Wiring circuits. 3. Circuit testing.
6. Test Storage Battery		

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Body Electrical
SUB – UNIT :	Storage Battery
PERFORMANCE OBJECTIVE NO. :	VI
TITLE :	Battery Construction and Operation

RESOURCES :
1. Film List
2. Textbook
3. Cut-away Battery
4. Battery Testers

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View Film	Film: "Electric Power for Safety"	
2. Connect Batteries in Series and Parallel	Auto Mechanics Fundamentals- Chapter 19, pp. 370-375	Written Assignment: p. 405, Q. 24-36
	Film: "It's Easy to be an Expert"	
	Auto Service and Repair Chapter 22, pp. 1-10	Written Assignment: p. 51, Q. 1-32
3. Battery Service	Battery Specifications	
		Test Content: 1. Battery Fundamentals 2. Battery Service

57

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Body Electical

SUB-UNIT: Sealbeam Headlight

PERFORMANCE OBJECTIVE NO.: VI

TITLE: Replace Sealbeam Headlight

RESOURCES:

1. Assign vehicle
2. Assign job sheet
3. Furnish sealbeam unit
4. Safety factors

(This Sub-unit may be accomplished on a mock-up or an existing vehicle.)

ACTIVITY: After completing related unit on Body Electrical, proceed with the following:

1. Select tools.
2. Remove headlight rim.
3. Remove sealbeam door and retaining screws.
4. Carefully remove and unplug sealbeam unit.
5. Carefully plug in sealbeam unit.
6. Install sealbeam door and retaining screws.
7. Check headlight adjustment and correct if necessary.
8. Install headlight rim.
9. Practice all safety rules.
10. Replace tools.
11. Clean area for next unit.

EVALUATION:

The student will remove and replace sealbeam unit to meet instructor's standards.

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Body Electrical

SUB-UNIT: Storage Batteries

PERFORMANCE OBJECTIVE NO.: VI

TITLE: Testing Storage Batteries

RESOURCES:

1. Assign vehicle
2. Assign job sheet
3. Review use of hydrometer
4. Review safety rules

ACTIVITY: After completing related theory, proceed with the following:

1. Look the battery over carefully for corroded terminals, broken case or cover, loose posts, lost or cracked sealing compound, and dirt on the cover.
2. Remove the cable clamps from the battery terminals.
3. Use special battery- terminal cleaner brushes to clean the clamps and battery terminals.
4. Replace the cable clamps on the battery terminals.
5. Remove the vent plugs, and check the electrolyte level in all cells.
6. Add water, if necessary, to bring the electrolyte up to proper level.
7. Insert the rubber tube of the hydrometer into the first cell. Squeeze the rubber bulb so that enough electrolyte will be drawn into the hydrometer to suspend the float.
8. Be sure your eyes are level with the electrolyte when you take the readings.
9. Squeeze the bulb to return the electrolyte to the cell.
10. Repeat for each cell in the battery.
11. Rinse out the hydrometoer with plain water.

EVALUATION:

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Body Electrical

SUB-UNIT: Testing for Short in Lighting Circuit

PERFORMANCE OBJECTIVE NO.: VI

TITLE:

RESOURCES:

1. Assign vehicle
2. Assign job sheet
3. Review circuit test procedure
4. Review safety rules

ACTIVITY: After completing related theory proceed as follows:

1. Find area of problem.
2. With circuit breaker in place of fuse, test wire with circuit tester.
3. Probe wire until voltage is lost.
4. Back track until voltage is located again.
5. Short is between where the voltage was lost and where it was again located.

60

EVALUATION:

The student will locate and repair short circuit in lighting to satisfaction of instructor.

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Body Electrical

SUB-UNIT: Storage Batteries

PERFORMANCE OBJECTIVE NO.: VI

TITLE: Light-load testing of batteries in the car

RESOURCES:

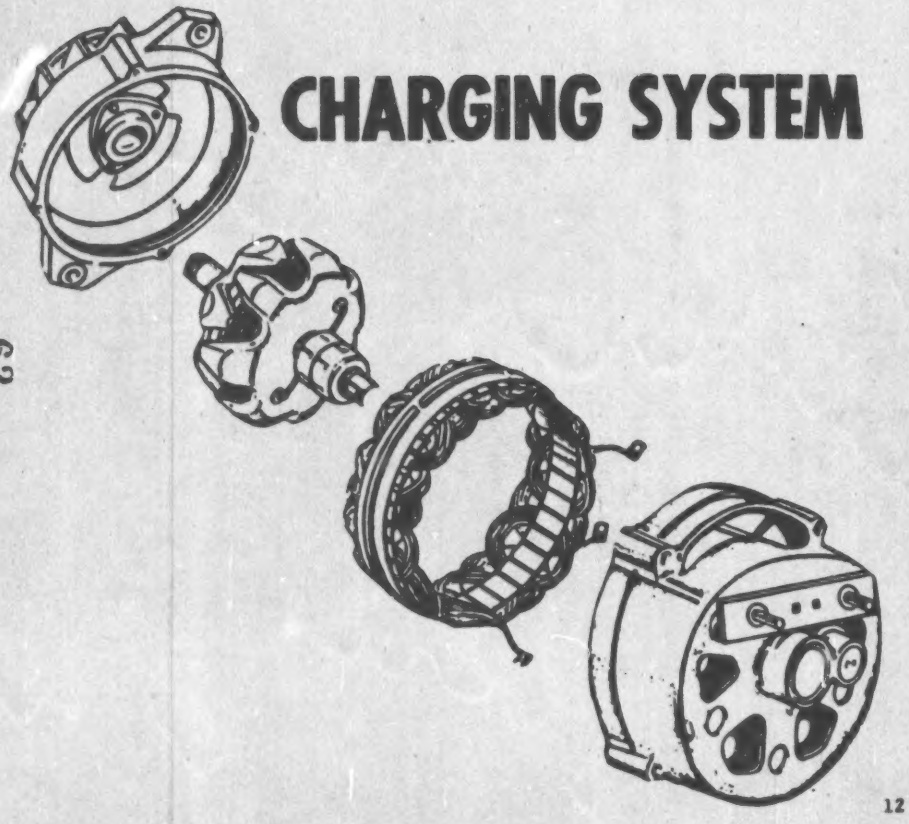
1. Motors Manual
2. Auto Service and Repair
3. Tools
4. Safety Procedure

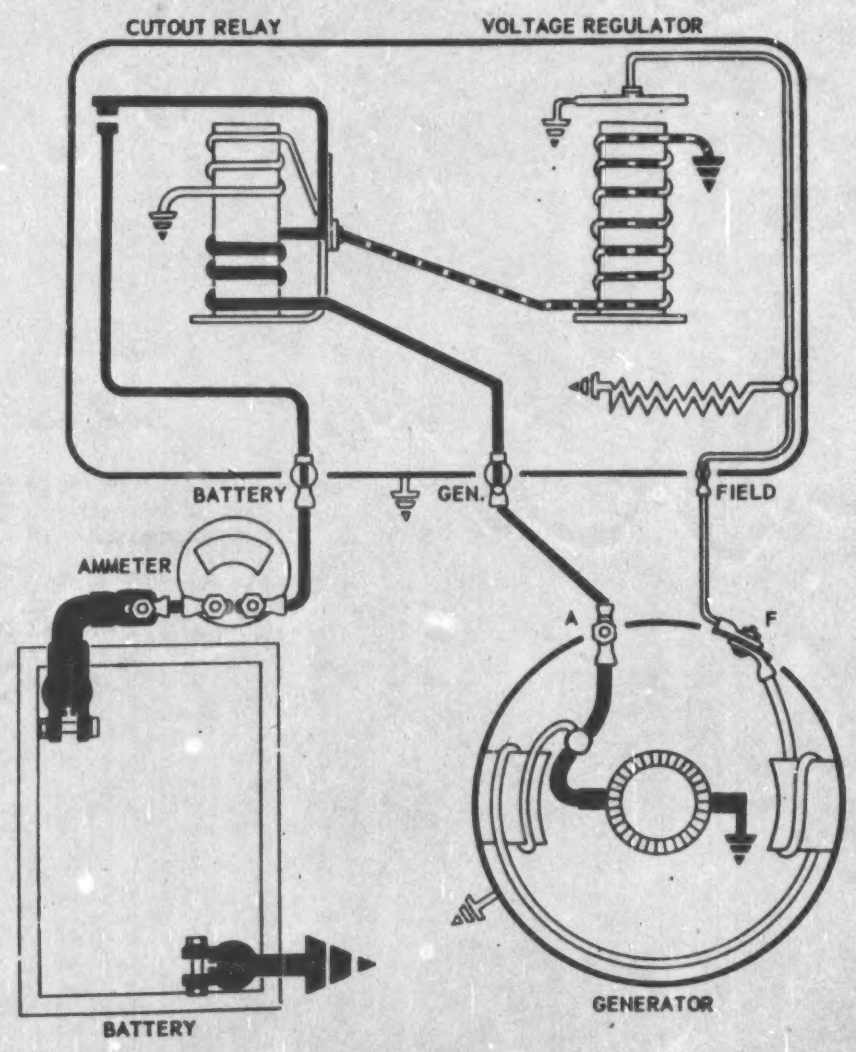
ACTIVITY: Proceed in the following manner:

1. Cover the fender with a fender cover.
2. Examine the condition of the battery-covers, case, connectors, and terminals. Examine the condition of the cables, cable clamps, and battery hold-down clamps.
3. If the electrolyte level is low, add water.
4. Put a momentary load on the battery by using the clanking motor for three (3) seconds.
5. Turn on the headlight low beams. After one (1) minute, with the lights still on, read the individual cell voltages with the expanded-scale voltmeter. Record the readings.

EVALUATION:

CHARGING SYSTEM





SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
VII. CHARGING SYSTEM 1. The charging system maintains the battery and entire electrical system in a healthy condition, so it is important that the student understand electrical theory in order to diagnose troubles and make repairs.	1. Provided the test equipment, the student will diagnose the charging system to determine the cause of failure and make corrective repairs to meet manufacturer's specifications.	1. View film and complete work sheet on charging system. 2. Operate *generator on training aid and record volts and amps. 3. Disassemble a *generator and test. 4. Assemble *generator replacing any defective parts. 5. With a volt amp tester, check the *generator output on an automobile. 6. Practice electrical safety rules. *Generator refers to both alternators and DC generators.	1. Provide a film and work sheet on charging system. 2. Provide operation sheet for *generator simulator. 3. Select *generator for disassembly and assembly. 4. Select automobile for *generator output test.	1. With problem diagnosis sheet and volt amp tester, check charging system on a selected automobile.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIALS RESOURCE
"II. CHARGING SYSTEM" 1. View films on charging circuit. 2. Complete work sheet on charging circuit. 3. Perform assignment on generator training aid. 4. Repair a generator replacing any defective parts. 5. Test a charging system for volt and amp output.	1. Provide films on charging circuit. 2. Hand out work sheet. 3. Supply generator training aid. 4. Supply generator for repair. 5. Select vehicle for output test. 6. Review electrical safety rules.	Film: Charging Circuit - Delco Remy Film: Delcotron Generator - Delco Remy Teacher-made work sheet. Training aid operation sheet. Automotive tune up manual. **Auto Mechanics Fundamentals - Stockel** **Auto Service and Repair - Stockel**

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Charging System
SUB – UNIT :	D.C. Generator
PERFORMANCE OBJECTIVE NO. :	VII
TITLE :	Generator and Regulator Fundamentals

RESOURCES :
1. Film List
2. Textbook
3. Wire Diagram
4. Generator Simulator

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View film	Film: "Regulation and the Charging Circuit."	
2. Color code generator wiring diagram	Auto Mechanics Fundamentals - Chapter 19, pp. 370-385	Written Assignment: p. 405, Questions 37-55
3. Wire gerator circuit on simulator	Auto Service and Repair - Chapter 22, pp. 11-23	Written Assignment: p. 52, Questions 33-51
4. Turn Armature Commutator and Under Cut Mica	Armature Lathe	Test Content:
5. Test Generator Armature and Field	Armature Growler	1. Generator fundamentals. 2. Problem indication. 3. Generator service.

69

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Charging System
SUB – UNIT :	Alternator
PERFORMANCE OBJECTIVE NO. :	VII
TITLE :	Alternator and Regulator Fundamentals

RESOURCES :
1. Film List
2. Textbook
3. Wire Diagram
4. Alternator Simulator

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View Film	Film: "Generator and New Charging Circuit"	
2. Color Code Wiring Diagram	Auto Mechanics Fundamentals Chapter 19, pp. 385-391	Written Assignment: p. 405, Q. 56-59
3. Wire Alternator Circuit on Simulator	Auto Service and Repair Chapter 22, pp. 23-41	Written Assignment: p. 52, Q. 52-77
4. Test Rotor and Startor	Test Light or Ohmmeter	

Test Content:

1. Alternator Fundamentals
2. Problem Indication
3. Alternator Service

99

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Charging System

SUB-UNIT: Fan Belt Adjustment

PERFORMANCE OBJECTIVE NO.: VII

TITLE: Adjusting Fan Belt Tension

RESOURCES:

1. Demonstration of this Sub-unit
2. Assign vehicle or mock-up
3. Assign job sheet
4. Safety factors

(This Sub-unit may be accomplished on a mock-up or an existing vehicle.)

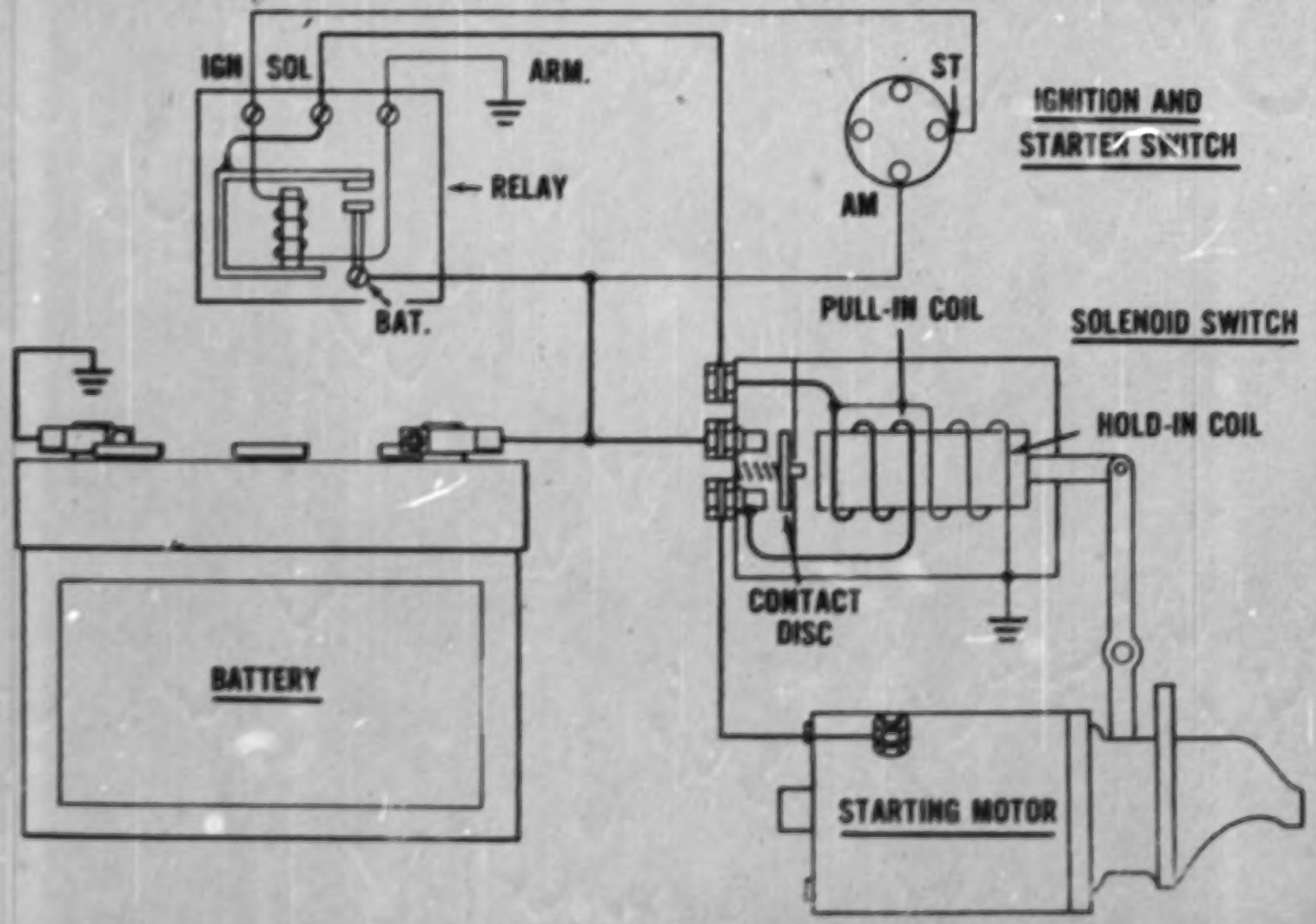
ACTIVITY: After completing the related theory on the charging system, proceed as follows:

1. Determine if belt needs adjustment.
2. Loosen adjusting bolt on alternator.
3. Loosen alternator mounting bolt.
4. Pull alternator to desired tension.
5. Tighten adjusting bolt.
6. Again check belt tension. If adjustment did not move, proceed.
7. Tighten mounting bolts.
8. Recheck belt tension.
9. Observe all safety rules.
10. Pick up tools and clean them.
11. Clean work area for next unit.

EVALUATION:

The student will adjust fan belt tension with 100% accuracy. LEARNING TIME: 30 minutes

STARTING SYSTEM



UNIT VIII

STARTING SYSTEM

1. Starting motor
2. Starter drives
3. Electrical switches

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
VIII. STARTING SYSTEM				
1. The starting system is a very essential part of the engine. The student should know and understand basic electricity and the components in the starting system to successfully service and repair the deficiencies.	1. Provided with a starting motor Training Aid and work sheet, trace the circuitry and describe all units in the system, filling in all blanks on the work sheet correctly.	1. View film on basic circuits and symbols.	1. Conduct class discussion on the starting system.	1. Pencil test on starting system.
		2. View and participate in demonstration on the starting motor Training Aid.	2. Conduct and point out techniques in starter system diagnosis and repair.	2. Grade students work sheets.
	2. Assigned an automobile with a malfunction in the starting system, search out the problem, order the parts, and repair according to Motor's repair manual specifications.	3. Search out the problem in an existing automobile making sure all areas are checked: a. Ignition Suited b. Starter Solenoid c. Wiring (External) d. Battery Terminals e. Starter (1) Circuitry (2) Components	3. Hand out starter system work sheet and explain. 4. Furnish automobile for actual hands on shop work.	3. Evaluate students work performance on automobile, according to work sheet, and discuss it with him.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
VIII. STARTING SYSTEM. 1. View demonstration and discussion on starting system. 2. Perform lab assignment on starter training aid. 3. Remove and check all components. 4. Report parts needed. 5. Repair, replace on vehicle and test.	1. Demonstration and lecture on starting system and components. 2. Assign lab unit with work sheet. 3. Assign vehicle. 4. Provide parts. 5. Check proper procedures and grade. 6. Prepare test. 7. Review safety procedures.	Teacher-made training aid. Automotive Electrical Systems - Automotive Electrical Association Starter Slides - Jam Handy Starter Transpariencies - McGraw-Hill Teacher-made work sheet. Film: The Cranking Circuit - Delco-Remy Starter test. Automotive Tune-up Principals and Procedure - Ignition Manufacturers Institute. Auto Mechanics Fundamentals - Stockel Auto Service and Repair - Stockel

71

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Starting System
SUB – UNIT :	Starting Motor
PERFORMANCE OBJECTIVE NO. :	VIII
TITLE :	Starter System and Service

RESOURCES:
1. Film list
2. Textbook
3. Wire Diagram
4. Starter Simulator

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View film.	Film: "The Cranking Circuit"	
2. Color code starter wire diagram.	Auto Mechanics Fundamentals - Chapter 19, pp. 392-398	Written Assignment: p. 406, Q. 60-66
3. Wire starter motor on simulator.	Auto Service and Repair - Chapter 22, pp. 42-49	Written Assignment: p. 53, Q. 78-89
4. Turn Armature Commutator and Under Cut Mica	Armature Lathe	Test Content:
5. Test Starter Armature and Field	Armature Growler	1. Starter operation 2. Electrical wiring 3. Starter service

72

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Starting System

SUB-UNIT: Starter Solonoid

PERFORMANCE OBJECTIVE NO.: VIII

TITLE: Check, remove and replace solonoid

RESOURCES:

1. Demonstrate proper procedure
2. Assign vehicle
3. Assign job sheet
4. Review safety procedures

(This lesson is on a Chrysler product.)

ACTIVITY: After related class lesson on starting system, proceed as follows:

1. Place seat cover on vehicle seat.
2. Place vehicle in work area.
3. Place fender covers on vehicle after raising hood.
4. Select tools needed.
5. Check solonoid following steps in Motor's Manual.
6. Disconnect positive battery cable.
7. Remove all wires from solonoid switch.
8. Remove mounting bolts.
9. Mount new solonoid.
10. Connect all wires properly.
11. Connect positive battery cable.
12. Check for proper operation.
13. Pick up all tools and clean.
14. Remove fender covers.
15. Close hood.
16. All safety rules will be followed.
17. Place car in finished area.
18. Remove seat cover from vehicle
19. Clean work area for next unit.

EVALUATION:

The student will check, remove and replace starter solonoid to meet instructor's standards.
LEARNING TIME: 30 minutes

J-1

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Starting Systems

SUB-UNIT: Starting Motor Part 3 of 3

PERFORMANCE OBJECTIVE NO.: VIII

TITLE: Servicing the Starting Motor

RESOURCES:

1. Motors Manual
2. Auto Service and Repair
3. Tools
4. Safety Procedure

ACTIVITY: After completing part one-proceed as follows:

1. Use clean towels, a brush, and compressed air to clean the armature, field coils, and overrunning clutch. Wash all other parts in solvent, and dry with compressed air.

2. Check the end-frame and drive-housing bearings for excessive wear. Inspect all other parts for wear and defects.

3. Inspect the armature for rubbing on the pole shoes, and the armature-shaft bearing surfaces for roughness and wear. Inspect the armature windings for broken or burned insulation and unsoldered connections. Check the armature on a growler. Turn the commutator, if required.

4. Check the brush holders for broken springs. Check the insulated brush holders for shorts. Tighten any rivets that are loose. Replace the brushes if worn to ¼ inch or less in length.

5. Check the field coils for burned or broken insulation and for continuity. Check the field brush connections and lead insulations.

6. Examine the wear pattern on the overrunning-clutch teeth. Replace an overrunning-clutch or ring gear that has chipped, cracked or excessively worn teeth or that shows a pattern of inadequate teeth engagement.

7. Check the overrunning-clutch for locking. Grasp the overrunning-clutch in one hand, and rotate the drive pinion gear with the other hand. The gear should rotate freely in one direction and lock in the opposite direction.

EVALUATION:

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Starting Systems

SUB-UNIT: Starting Motor Part 2 of 3

PERFORMANCE OBJECTIVE NO.: VIII

TITLE: Servicing the Starting Motor

RESOURCES:

1. Motors Manual
2. Auto Service and Repair
3. Tools
4. Safety Procedure

ACTIVITY:

10. After installing the solenoid, replace the bolt connecting the field leads to the solenoid starting motor terminals. Replace the brush-cover band and the starting-motor drive-plunger-lever cover, if used.

11. Check the pinion clearance. On a starting motor with a solenoid attached, connect a 6 - volt power supply to the solenoid S terminal and ground.

12. Energize the solenoid. Push the pinion away from the stop retainer as far as possible. Use a feeler gauge to check the clearance between the pinion and the retainer. A typical clearance is between 0.010 and 0.140 inch (0.254 and 3.556 mm).

13. If the clearance is not within specifications, excessive wear of the solenoid linkage or shift-lever mechanism is indicated. Improper assembly of the linkage may also cause improper clearance. Disassemble the starting motor, and replace the defective parts.

14. Before installing the starting motor, clean the startin-motor and flywheel-housing mounting surfaces. This will ensure good electrical contact.

EVALUATION:

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Starting Systems

SUB-UNIT: Starting Motor Part 1 of 3

PERFORMANCE OBJECTIVE NO.: VIII

TITLE: Servicing the Starting Motor

RESOURCES:

1. Motors Manual
2. Auto Service and repair
3. Tools
4. Safety Procedure

ACTIVITY. After completing part two-proceed as follows:

1. To assemble the starting motor, lubricate the armature shaft and install the overrunning clutch with the pinion outward. Install a new snap-ring in the groove on the armature shaft.

2. Move the snap-ring retainer upto the snap-ring. Use pliers on opposite sides of the shaft to squeeze the retainer and thrust collar until the retainer is forced over the snap-ring.

3. Lubricate the drive-housing bushing and shift-lever linkage. Install the shift-lever linkage in the drive housing.

4. Install the armature with spacers in the drive-housing. Be sure the shift-lever is in place on the drive assembly

5. Install the brushes and leads in the bruch holders. Position the brush holders and spring assemblies in the field frame, and install the pivot pins.

6. Lubricate the bushings in the commutator end frame. Assemble the field frame over the armature to the drive housing. Spread the brush holders apart enough for the brushes to clear the commutator.

7. There are a locating pin and a matching recess in the drive housing and the field frame. Align the pin with the recess, and assemble the commutator end frame to the field frame. Install and tighten the through bolts.

8. Check the armature end play. Move the armature toward the commutator end frame. Use a feeler gauge to check the end-play clearance between the snap-ring retainer and the drive housing. Typical end-play clearance should be 0.005 inch (0.127 mm) to 0.050 inch (1.27 mm). If necessary; diassemble the starting motor and change the armature spacers as required to obtain the correct armature end play.

9. If a soenoid mounts to the starting motor, apply sealing compound to both sides of the solenoid flange that locks into the drive housing. Install the solenoid with the plunger-return spring over the plunger. Depress and rotate the solenoid flange into place. Install the two solenoid-to-drive-end-frame bolts.

EVALUATION:

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Starting Systems

SUB-UNIT: Starting Motor

PERFORMANCE OBJECTIVE NO.: VIII

TITLE: Disassembling the Starting Motor

RESOURCES:

1. Motors Manual
2. Auto Service and Repair
3. Tools
4. Safety Procedure

ACTIVITY: Proceed as follows:

1. If the starting motor has a solenoid attached, disconnect the field leads from the solenoid starting-motor terminals. Remove the two soleniod-to-starting-motor attaching bolts. Rotate the solenoid about one-quarter turn to release its retainipg lip from the starting motor. Remove the solenoid.

2. If equipped, remove the brush-cover band and the starting-motor drive-plunger-lever cover.

3. Remove the through bolts. Carefully observe the commutator brush-lead positions. Then disconnect the brush leads, and remove the brushes.

4. Remove the starting-motor commutator end frame. Remove the field-frame assembly.

5. Remove the shift-lever pivot bolt, plunger, shift lever, and armature from the drive-housing.

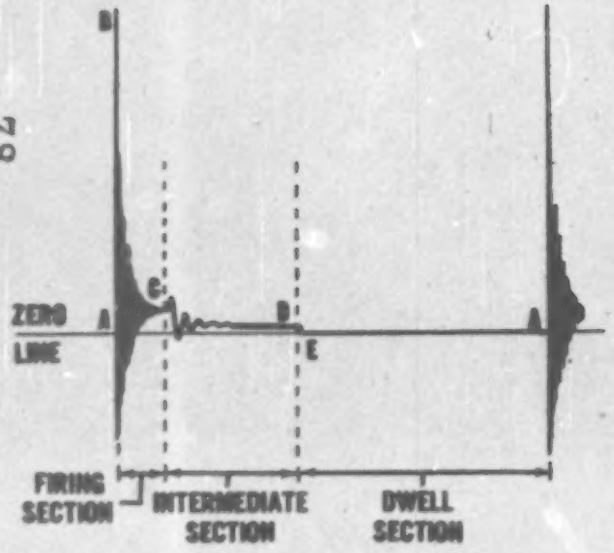
6. To remove the overrunning clutch from the armature, disengage the snap-ring retainer. Then slide the overrunning clutch off the armature shaft.

EVALUATION:

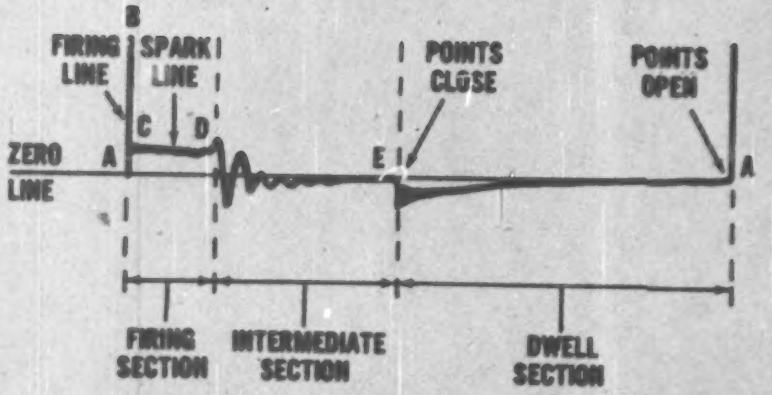
ENGINE

TUNE-UP

PRIMARY



SECONDARY



78

UNIT IX

ENGINE TUNE-UP

1. Ignition System

2. Fuel System

3. Emission Controls

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
IX. ENGINE TUNE-UP 1. Ignition tune-up today, with the ecology program demanding cleaner air, is more technical than a few years back. The mechanic today must know the ignition system	1. Given the theory and equipment, tune up an engine to acquaint the student with the various operations involved. The student will also develop self-confidence in using test equipment.	1. Hands on tune-up on lab engines. a. Check compression b. Check vacuum c. Check ignition defects d. Replace spark plugs e. Replace points f. Replace condenser (e and f not in electronic ignition) * g. Check electronic components (1) Control box (2) Magnetic pick-up (3) Reluctor h. Set dwell i. Set idle speed j. Set timing k. Exhaust gas analysis 2. Repeat activity #1 using actual vehicle in the shop. 3. Upon approval of job performed, place car in proper area. 4. All safety standards apply. *Only check if vehicle has electronic ignition.	1. Present engine tune-up theory to class. 3M Transparencies - "The Spark & Ignition", "The Ignition System". 2. Hand out to students check sheet and assign lab engine. 3. Assign vehicle in shop. 4. Hand out check sheet and issue parts needed for tune-up. 5. Review with student any area he may have had difficulty with.	1. Lab assignment graded by check sheet. Student proficiency recorded on check sheet. 2. Shop assignment graded by results of engine analyzer and exhaust gas analyzer. 3. Grade student on finished project and record on progress record chart.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
IX. ENGINE TUNE-UP 1. Participate in hands on demonstration and discussion. 2. Perform tune-up on lab engine and follow work sheet. 3. Can perform actual tune-up on automobile. 4. Can test finished tune-up on infrared gas analyzer.	1. Demonstrate and discuss tune-up and emissions. 2. Assign lab engine and work sheet. 3. Assign vehicle. 4. Discuss ecology program. 5. Demonstrate use of infrared tester. 6. Prepare test.	Automotive Tune-up Principles and Procedure - Ignition Manufacturers Institute Automotive Encyclopedia - Motors Auto Mechanics Fundamentals - Stockel Auto Mechanics - Harold T. Glenn U. S. Government pamphlet Allen, Marquette, Snap-on Auto Service and Repair - Stockel Film: Performance for Safety - Car Education Institute 20,000 Volts Under the Hood - Delco-Remy

RE[illegible]ED INSTRUCTION

PROGRAM:	Auto Mechanics
UNIT:	Tune-Up
SUB – UNIT:	Ignition System
PERFORMANCE OBJECTIVE NO.:	IX
TITLE:	Ignition System Fundamentals and Service

RESOURCES:
1. Film List
2. Textbook
3. Ignition Simulator
4. Dwell and Tachometer
5. Timing Light
6. Service Manual

ACTIVITY (STUDENT)	REFERENCE:	EVALUATION:
1. View Film	Film: "20,000 Volts Under the Hood"	
2. Operate Ignition Training Simulator	Auto Mechanics Fundamentals Chapter 3, pp. 53-73	Written Assignment: p. 74, Q. 1-37
3. Adjust Point Dwell on Simulator	Auto Service and Repair Chapter 21, pp. 1-32	Written Assignment: p. 33, Q. 1-54
4. Adjust timing on Simulator	Motors Service Manual	
5. Test Coil and Condenser	Coil Condenser Tester	
6. Repair Distributor and Test	Distributor	

Test Content:

1. Ignition system operation
2. Testing ignition system
3. Service ignition system

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Engine Tune-up Part 1 of 2

SUB-UNIT: Ignition Harness (Secondary)

PERFORMANCE OBJECTIVE NO.: IX

TITLE: Remove, Test and/or Replace Secondary Wires

RESOURCES:

Use mock-up or complete vehicle.

1. Assign engine or vehicle
2. Assign job sheet
3. Review test equipment
4. Review safety rules.

ACTIVITY: After completing related theory, proceed as follows:

1. Place seat cover in vehicle.
2. Move vehicle into work area.
3. Raise hood.
4. Place fender covers.
5. Select tools.
6. Disconnect battery cable.
7. Remove air cleaner.
8. Note location of #1 plug wire.
9. Unhook retainer clips from cap.
10. Lift distributor cap free.
11. Remove secondary coil wire from coil.
12. Remove wires from plugs.
13. Remove wire clips on engine.
14. Lift cap and wire from engine.
15. Inspect and test wires with ohm meter.
16. Remove wires from cap and label.
17. Test cap with ohm meter.
18. Test wires with ohm meter.
19. Clean all wires and connections.
20. Place cap on distributor and fasten.
21. Wire according to firing order.
22. Insert coil wire.
23. Pick up all rags and tools from engine.

EVALUATION:

The student will satisfactorily remove, test and replace secondary wires. LEARNING TIME: 1½ hours

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Engine Tune-up Part 2 of 2

SUB-UNIT: Ignition Harness (Secondary)

PERFORMANCE OBJECTIVE NO.: IX

TITLE: Remove, test and/or replace secondary wires

RESOURCES:

Refer to part 1

ACTIVITY:

24. Start engine.
25. If engine runs properly, install air cleaner.
26. Observe all safety rules.
27. Pick up and clean all tools.
28. Remove fender covers.
29. Close hood.
30. Park vehicle in proper place.
31. Remove seat cover.
32. Clean work area.

EVALUATION:

RELATED INSTRUCTION

PROGRAM: Auto Mechanics
UNIT: Engine Tune-up
SUB-UNIT: Engine Systems

PERFORMANCE OBJECTIVE NO.: IX
TITLE: Engine System Diagnosis

RESOURCES:

1. Film list
2. Text bok
3. Tune-up check list
4. Service Manual

ACTIVITY (STUDENT):

1. View film
2. Compression test
3. Vacuum test
4. Oscilloscope test

REFERENCE:

Film: Preformance for Safety

Auto Service and Repair
Chapter 23 pp. 1-31

Motors Service Manual
Test Equipment
Compression gauge
Vacuum gauge
Oscilloscope

EVALUATION:

Written Assignment
p. 31 Questions 1-25

Test Content:

1. Basic Tune-up
2. Major Tune-up
3. Testing Procedures

VERMONT

PERIODIC INSPECTION

28

VERMONT DEPT. OF MOTOR VEHICLES
J. E. Bailey - Commissioner

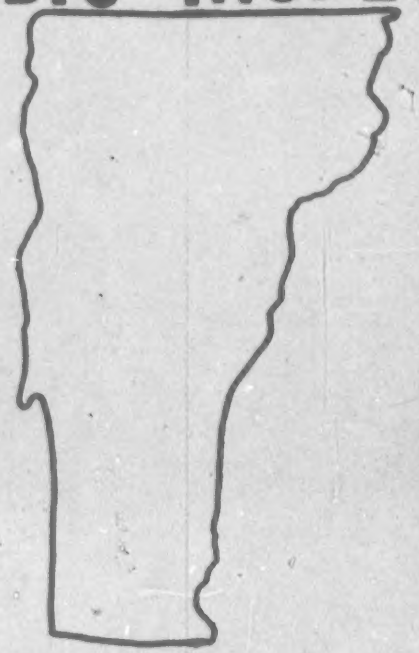
V. I. N. _____

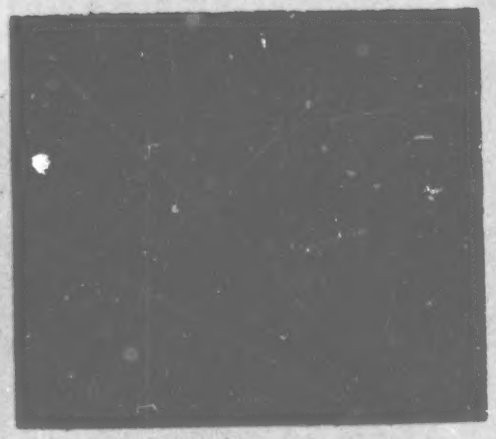
Mileage _____

Station No. _____

Date Inspected _____

NEXT INSPECTION OF THIS VEHICLE
REQUIRED DURING MAY - JUNE 1974





UNIT X

STATE INSPECTION

1. General information

2. Inspection standards

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
X. STATE INSPECTION			Explain use of the Vermont Inspection Manual	
1. All motor vehicles registered in the State of Vermont shall be inspected twice a year at intervals of six months at an official inspection station by a certified mechanic. It is important that all work done on an automobile meet inspection standards.	1. Using the Vermont Periodic Inspection Manual as a guide, the student when given an automobile to inspect for defective equipment will indicate approval for inspection sticker or record any repairs needed before the vehicle will pass inspection.	1. Participate in class discussion on state inspection. 2. With the State Inspection Manual as a guide, inspect a given vehicle to determine if it will meet inspection standards and make recommendations to your instructor. 3. Apply all safety standards.	1. Discuss general information section. 2. Explain the job each light performs. 3. Review the safety requirements for suspension, brakes, and tires. 4. Discuss body condition requirements. 5. Procedure for inspecting emission control system. 6. How to inspect safety equipment.	Grade the students on the learning activity through a check list on inspection manual.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
K. STATE INSPECTION		
1. Interprets all State Inspection Manual regulations.	1. Hand out State Inspection Manual and lead class discussion.	Vermont State Inspection Manual
2. List on work sheet items to be checked on vehicle.	2. Prepare work sheet.	
3. Can perform state inspection on actual vehicle.	3. Assign vehicle.	
	4. Contact State Inspector for licensing 18-year-old students.	

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	State Inspection
SUB – UNIT :	Brakes
PERFORMANCE OBJECTIVE NO. :	X
TITLE :	Inspect Brake System

RESOURCES : 1. State Inspection Manual
2. Textbook

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. Class discussion of inspection points.	Vermont Inspection Manual pp. 10-12 Auto Service and Repair Chapter 29, pp. 2-3	Oral review of inspection points. Test Content: 1. Brake Parts 2. Brake Service

06

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: State Inspection

SUB-UNIT: Brake Linings

PERFORMANCE OBJECTIVE NO.: X

TITLE: Check front linings for wear

RESOURCES:

1. Furnish complete vehicle
2. Assign job sheet
3. Review safety procedures

ACTIVITY: After completing related lesson, proceed as follows:

1. Place seat cover on vehicle seat.
2. Move vehicle into work area.
3. Jack up front of vehicle.
4. Place safety stands under vehicle.
5. Remove hub cap.
6. Remove wheel bearing dust cap.
7. Remove cotter pin from bearing nuts.
8. Remove wheel bearing nuts.
9. Remove wheel bearing and washer.
10. Remove wheel and hub assembly.
11. Check linings for wear.
12. Reassemble in reverse order.
13. Adjust wheel bearing.
14. Install new cotter pin.
15. Replace hub cap.
16. Jack vehicle and remove safety stands.
17. Lower vehicle.
18. Pick up and clean all tools.
19. Place vehicle in proper place.
20. Remove seat cover.
21. Clean work area.

EVALUATION:

The student will satisfactorily inspect front brakes for wear. LEARNING TIME: 45 minutes

BRAKE SYSTEM

16

UNIT XI

BRAKE SYSTEM

1. Drum brakes
2. Disc brakes
3. Power brakes

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XI. BRAKE SYSTEM				
1. From the safety aspect, the brake system is the most vital part of the automobile. With this factor it is imperative the student have a thorough knowledge of the complete system.	1. Supplied with a vehicle, the student will perform a complete brake service and repair to meet manufacturer's specifications.	1. Discussion and demonstration on the brake system.	1. Lead discussion and demonstrate proper procedures in performing a brake service and repair.	1. Pencil and paper test.
2. THE BRAKE SYSTEM IS A MATTER OF LIFE AND DEATH.		2. Practice the procedures performed in brake service and repair.	2. Observe student procedures in brake service and repair.	2. Grade on lab unit.
		3. Inspect condition of the brakes and order parts to correct problem. a. Master cylinder b. Brake lines c. Condition of brake shoes d. Repair or replace wheel cylinders e. Turn down if needed f. Arc linings g. Reassemble and adjust h. Bleed lines	3. Supply vehicle for brake service, furnish parts and work sheet.	3. Grade on overall performance and work sheet.
		4. Turn in work order.	4. Give safety standards for brake unit.	
		5. All safety standards apply.	5. Make work order.	

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XI. BRAKE SYSTEMS 1. Will diagram and explain the hydraulic system. 2. Will explain and/or list the function of the brake systems. 3. To [illegible] the brake system. 4. Will perform services on the brake system. 5. Will turn drums or rotors on brake lathe and arcing linings. 6. Will assemble, adjust and bleed a brake system.	1. Display and discuss diagram of the hydraulic brake system. 2. Present instruction on the theory of operating of the brake system. 3. Discuss problems and malfunctions in the brake system. 4. Demonstrate on mock-up brake system the techniques in brake service. 5. Assign vehicle to student. 6. Prepare paper and pencil test. 7. Pass out lab unit and work sheet. 8. Collect and grade lab unit and work sheet.	Brake Diagram - Bendix Film: Chrysler Corporation Technical Film Automotive Mechanics Fundamentals by Stockel Amoco Corporation - Film, Operation Manual Auto Service and Repair by Stockel Film: Evolution of Brakes - Ford Brake Care For Safety -Car Education Institute Drum Brake Service -Chrysler 69 Disc Brake Service - Chrysler 72

RELATED INSTRUCTION

PROGRAM:	Auto Mechanics
UNIT:	Brake System
SUB – UNIT:	Disc Brakes
PERFORMANCE OBJECTIVE NO.:	XI
TITLE:	Disc Brake Operation and Service

RESOURCES:
1. Film List
2. Textbook
3. Brake Training Unit

ACTIVITY (STUDENT)	REFERENCE:	EVALUATION:
1. View film	Film: "Evolution of Brakes"	
2. Disassemble and assemble brake on training unit	Auto Mechanics Fundamentals Chapter 18, pp. 350-360	Written Assignment: p. 361, Q. 33-42
	Auto Service and Repair Chapter 29, pp. 27-35	Written Assignment: p. 36, Q. 33-38
3. View film	Film: "Disc Brake Service"	
		Test Content: 1. Disc Brake Fundamentals 2. Brake Trouble Diagnosis 3. Disc Brake Service

SHOP JOB SHEET

PROGRAM: Automotive

UNIT: Brake Systems Page 3 of 3

SUB-UNIT: Condition of Brake Disc Pads

PERFORMANCE OBJECTIVE NO.: XI

TITLE: Inspection Disc Pads

RESOURCES:

See Page 1

ACTIVITY: Re: page (i) Line 9
Inspection Disc Brakes

1. Remove front hub caps
2. Remove front lug nuts
3. Remove front wheels
4. Inspect for brake leaks, all lines and calipers
5. Inspect both inner and outer disc pads on each side of the disc brake rotor (thickness minimum 1/16")
6. Inspect rotors for roughness and trueness
7. Call instructor to confirm findings on condition of disc pads, brakelines, calipers, and rotors.
8. Passing inspection proceed as follows
9. Install front wheels
10. Tighten wheel lugs
11. Re-install hub caps
12. Call instructor to evaluate job.

EVALUATION:

J-1

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Brake System

SUB-UNIT: Bleeding Brakes

PERFORMANCE OBJECTIVE NO.: XI

TITLE: Rsmove air from brake lines

RESOURCES:

1. Assign vehicle
2. Assign job sheet
3. Review procedures
4. Review safety rules

ACTIVITY: After completing related lesson, proceed as follows:

1. Place seat cover on vehicle seat
2. Move vehicle into work area
3. Draw pressure bleeder from tool crib and be sure it is two-thirds (2/3) full.
4. Raise hood and place fender cover
5. Remove all dirt from top of master cylinder cover.
6. Remove master cylinder cover.
7. Connect pressure bleeder to master cylinder and hook up air.
8. Raise car on hoist or jack and use safety stands.
9. Bleed from right to left rear and right to left front.
10. Open bleeder fitting one-half (½) turn and let run until no air.
11. Lower vehicle and disconnect pressure bleeder.
12. Replace master cylinder cover.
13. Pick up and clean all tools.
14. Return pressure bleeder to crib.
15. Remove fender cover.
16. Try brake peddle for brakes.
17. If satisfactory, place vehicle in proper area.
18. Practice all safety rules.
19. Remove seat covers.
20. Clean work area.

EVALUATION:

The student will satisfactorily bleed a hydraulic brake system. LEARNING TIME: 45 minutes

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Brake System
SUB – UNIT :	Drum Brakes
PERFORMANCE OBJECTIVE NO. :	XI
TITLE :	Drum Brake Operation and Service

RESOURCES :
1. Film list
2. Textbook
3. Brake Training Unit

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View film.	Film: "Evolution of Brakes"	
2. Disassemble and assemble brake on training unit.	Auto Mechanics Fundamentals - Chapter 18, pp. 333-350	Written Assignment: p. 360, Q. 1-32
	Auto Service and Repair - Chapter 29, pp. 1-26	Written Assignment: p. 36, Q. 1-32
3. View film.	Film: "Drum Brake Service"	

Test Content:

1. Drum Brake Fundamentals
2. Brake Trouble Diagnosis
3. Drum Brake Service

99

SHOP JOB SHEET

PROGRAM: Automotive

UNIT: Brake Systems Page 2 of 3

SUB-UNIT: Condition of Brake Shoes

PERFORMANCE OBJECTIVE NO.: XI

TITLE: Inspection Brake Shoes

RESOURCES:

See Page 1

ACTIVITY:

15. Install (2) rear wheels
16. Tighten lug nuts (2) rear wheels
17. Install (2) rear hub caps
18. Place two front wheels back on spindle
19. Install (2) front outer wheel bearings
20. Install spindle nuts tighten to correct tongue and secure with cotter keys.
21. Install dust cover and hub cap
22. Clean up tools and general area
23. Call instructor to evaluate job.

EVALUATION:

Student's job performance. Oral questioning concerning brake defects and the importance of quality work.

SHOP JOB SHEET

PROGRAM: Automotive

UNIT: Brake Systems Page 1 of 3

SUB-UNIT: Condition of Brake Shoes

PERFORMANCE OBJECTIVE NO.: XI

TITLE: Inspection Brake Shoes

RESOURCES:

1. Assign vehicle
2. Issue job sheet
3. Demonstrate to student
4. Air supply
5. Hand tools

ACTIVITY: After related theory on brake service inspection proceed as follows:

1. Assign vehicle
2. Raise vehicle on lift
3. Remove hub caps, rear wheels
4. Remove lug nuts, rear wheels
5. Remove brake drums
   (Note: If drum isn't free to remove, back off the adjusting screw. If still not free call instructor for assistance.)
6. Put on safety glasses
7. Clean brake shoe assemblies for inspection by blowing off assembly with air nozzle
8. Remove front wheel hub caps
   (Note: If Disc brakes, follow procedure outlined on page 3.)
9. Remove: (a) dust cap
   (b) outer wheel bearing
   (c) remove wheel assembly from spindle
10. Blow off brake assembly
11. Inspect for the following conditions:
    a. Drums for worn grooves
    b. Check brake shoes for wear (lining thickness minimum 1/16")
    c. Inspect linings for heat cracks
    d. Inspect for glazed conditions of linings
    e. Check all brake lines and wheel cylinders for leaks
12. Call instructor to evaluate condition of brake assemblies
13. Provided brake system passes inspection, proceed to re-assemble
14. Install (2) rear brake drums

EVALUATION:

3-4

STEERING SYSTEM

UNIT XII

STEERING SYSTEM

1. Rack and pinion
2. Recirulating ball
3. Power Steering

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XII. STEERING SYSTEM				
1. The steering system of an automobile is a vital system used in controlling the directional stability of the vehicle. Any service done on this system should meet manufacturer's specifications and pass state inspection.	1. Supplied with an automobile, the student will check the steering system for excess play and replace any parts and adjust to meet manufacturer's specifications.	1. Read assigned chapter on steering system and answer quiz questions. 2. Observe a demonstration by instructor. 3. Check the steering system and determine if any parts or adjustments are needed. 4. Follow all safety standards.	1. Prepare a reading and written assignment from textbook. 2. Demonstrations: a. With classroom mock-ups, show operation of steering systems. (1) Rack and pinion (2) Recirculating ball (3) Power steering hydraulic cylinder (4) Power steering self contained 3. Use mock-ups to show points of service and adjustment.	Paper and pencil test. Provide a vehicle to test student's knowledge of steering system service.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XII. STEERING SYSTEM		
1. Read assignment on steering system.	1. Assign text assignment.	Auto Mechanics Fundamentals - by Stockel
2. Complete on paper quiz questions at end of chapter.	2. Conduct demonstrations on steering system operation.	Auto Service and Repair - by Stockel
3. Check a steering system and service.	3. Select quiz questions.	Teacher selection.
4. Do written test on steering system.	4. Provide vehicle for service.	Teacher provide.
	5. Provide written test.	Teacher made.
	6. Review safety standards.	

RELATED INSTRUCTION

PROGRAM: Auto Mechanics UNIT: Steering System SUB-UNIT: Steering Linkage PERFORMANCE OBJECTIVE NO.: XII TITLE: Steering Linkage	RESOURCES: 1. Film list 2. Textbook 3. Steering diagram 4. Special tools

ACTIVITY (STUDENT):	REFERENCE:	EVALUATION:
1. View film	Film: "Convential Steering"	Written Assignment: p. 331 Questions 1-16
2. Name parts on steering linkage diagram	Auto Mechanics Fundamentals Chapter 17, pp. 307-315	
3. Practice use of special tools	Auto Service and Repair Chapter 31, pp. 20-27	Written Assignment p. 41, Q. 23-32

Test Content:

1. Steering linkage operation
2. Problem diagnosis
3. Linkage repair

106

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Steering System

SUB-UNIT: Tie Rod Ends

PERFORMANCE OBJECTIVE NO.: XII

TITLE: Replace tie rod end and adjust

RESOURCES:

1. Assign vehicle
2. Assign job sheet
3. Review procedures
4. Review safety rules

ACTIVITY: After completing related theory on this unit, proceed as follows:

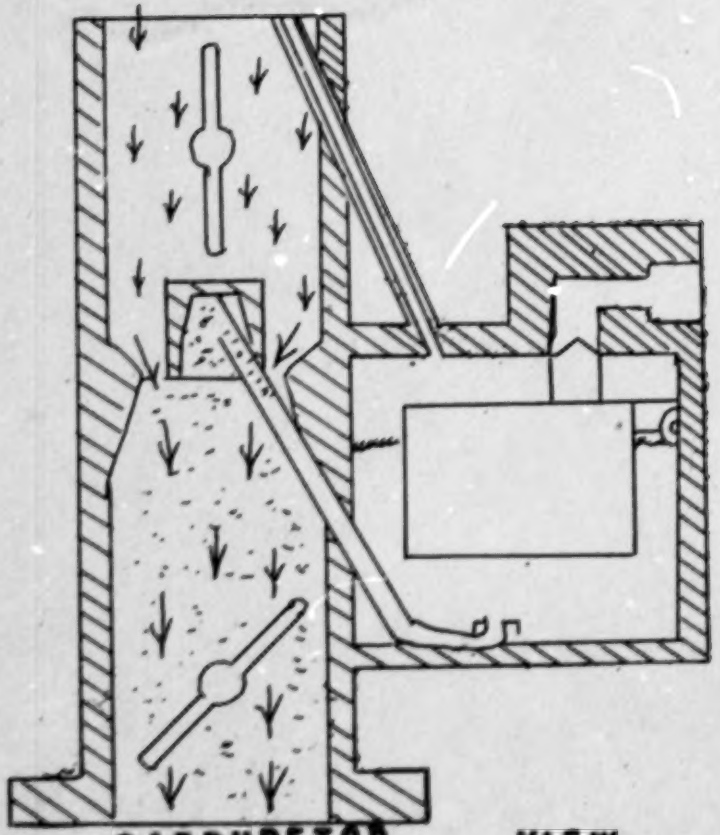
1. Place seat cover on vehicle seat
2. Move vehicle into work area
3. Draw tie rod removing tool from tool crib
4. Lift car on hoist
5. Select tools needed
6. Remove cotter pin from tie rod
7. Remove castilated nut
8. With special tool remove tie rod
9. Loosen locking sleeve
10. Count number of turns required to remove tie rod
11. Install new tie rod same number of turns required to remove
12. Install tie rod in knuckle arm
13. Install nut and new cotter pin
14. Check toe-in adjustment and adjust if necessary
15. Clean and replace tools
16. Practice all safety rules
17. Move vehicle to finished area
18. Remove seat cover and put in proper place
19. Clean work area for next assignment

EVALUATION:

The student will replace tie rod and adjust with 100% accuracy. LEARNING TIME: 1 hour

J-1

FUEL SYSTEM



SIMPLE CARBURETOR VIEW

UNIT XIII

FUEL SYSTEM

1. Fuel pumps

2. Carburetors

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XIII. FUEL SYSTEM				
1. The fuel system is a vital part of the vehicle because it has to furnish fuel to the engine, clean it and meter the amount being furnished.	1. Assigned a vehicle, inspect, service and/or repair the fuel system of the vehicle to meet manufacturer's specifications.	1. List all components of the fuel system and their functions. 2. Complete written assignment on Fuel System.	1. Furnish fuel components and explain their function. 2. Prepare written assignment on Fuel System.	1. Pencil and paper test.
2. DANGER - FIRE HAZARD.		3. Check, service or replace the following: a. Service fuel lines b. Fuel pump c. Sediment bowl d. Replace fuel filter e. Service air cleaner f. Service carburator	3. Demonstration on the six items student is performing.	2. Grade on student demonstration.
		4. Turn over to instructor for inspection and approval.	4. Approve or disapprove unit.	3. Enter on progress record sheet the particular part of the fuel system which was grades.
		5. Safety a. Eye b. Fire Hazard	5. Appropriate safety lecture or demonstration.	

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XIII. FUEL SYSTEM 1. Will list all fuel components and explain their function. 2. Can do visual inspection for leaks or damaged hoses. 3. Check fuel flow. 4. Replace filters. 5. Disassemble carburetor, identify on work sheet, and reassemble. 6. Adjust carburetor with vacuum gauge and tachometer.	1. Through class discussion explain all fuel components, their proper name and functions. 2. Demonstrate use of special test equipment. 3. Assign fuel components in lab. 4. Prepare work sheet and hand out. 5. Grade work sheet. 6. Prepare test. 7. Emphasize the danger of fire while working on fuel systems. 8. Review safety procedures.	Auto Mechanics Fundamentals - Stockel Auto Service and Repair - Stockel Filmstrip on Fuel System - McGraw-Hill Chrysler Corporation Technical Film **Film: Fuel System Principles - Ford** **Filtration for Safety - Car Care Institute**

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Fuel System
SUB – UNIT :	Fuel Pumps
PERFORMANCE OBJECTIVE NO. :	XIII
TITLE :	Fuel Pump Operation and Service

RESOURCES :
1. Film list
2. Text book
3. Service manual
4. Fuel Pumps

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View film	1. Film: "Fuel System Operation"	
2. Test fuel pump pressure	2. Auto Mech. Fund. pp. 115-123	2. Written Assignment: pp. 152, Q. 1-7
	3. Auto Service and Repair pp. 1-16	3. Written Assignment: p. 34, Q. 1-16

Test Content:

Fuel Pump Operation
Fuel Pump Construction
Fuel Pump Service

112

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Fuel System

SUB-UNIT: Fuel Pump

PERFORMANCE OBJECTIVE NO.: XIII

TITLE: Remove, replace and test fuel pump

RESOURCES:

1. Motor's Auto Service Manual
   Chilton Auto Service Manual
   Mitchell Auto Service Manual
2. Furnish Check Sheet
3. Assign Vehicle

ACTIVITY: After satisfactory completion of all related training, proceed as follows:

1. Place Protective cover on seat of vehicle.
2. Move vehicle into proper work station.
3. Raise hood.
4. Place fender cover on vehicle.
5. Select proper tools and materials.
6. Select manual and locate proper specifications.
7. Clean area around fuel pump and fittings.
8. Remove gas cap and blow fuel out of line to prevent siphoning.
9. Remove attaching bolts from pump.
10. Remove pump from engine and place on work bench.
11. Clean old gasket from pump area on block and select new gasket.
12. Install fuel pump on engine following manual.
13. Make all connections.
14. Re-check all steps this far.
15. Test vacuum on pump.
16. Test pressure on pump.
17. If pump is satisfactory, clean and replace tools and materials to proper place.
18. Turn in check sheet to instructor.
19. Close hood.
20. Replace fender cover.
21. Place vehicle in parking area.
22. Remove seat cover and replace.
23. Clean work station for next project.

EVALUATION:

Satisfactorily remove, replace and test fuel pump to meet instructors' standards.

J-1

SHOP JOB SHEET

PROGRAM: Automotive

UNIT: Fuel System

SUB-UNIT: Service fuel line

PERFORMANCE OBJECTIVE NO.: XIII

TITLE: Replace fuel line

RESOURCES:

1. Related theory fire hazard
2. Cutting tool hack saw or tubing cutter
3. Screw driver and pliers

ACTIVITY: Repair fuel line

1. Assign vehicle.
2. Raise car on lift.
3. Inspect fuel line for rust and damaged areas.
4. If line defective cut out damaged or rusted section.
5. Replace with gas line fuel treated rubber hose.
6. Tighten clamps.
7. Start car inspect for leaks.
8. Contact instructor for final inspection.

EVALUATION:

To replace hose with no leaks - and observe safe work habits.

J-2

UNIT XIV

COOLING SYSTEM

1. Air cooling
2. Liquid cooling

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XIV. COOLING SYSTEM				
1. The cooling system of the automobile engine requires periodic service as a preventive maintenance measure. The student will develop an ability to detect leaks and faulty parts before they get serious.	1. Provided with an automobile, the student will perform cooling system service to meet the requirements of the engine manufacturer.	1. View film on cooling system operation. 2. Examine a cutaway model of a liquid cooling system. 3. Examine a mock-up of an air cooled engine. 4. Observe a demonstration of cooling system service. 5. Perform the preventive maintenance check on a liquid cooling system to meet manufacturer's specifications. 6. Follow safety rules. 7. Complete written assignment on cooling system	1. Provide film on cooling system operation. 2. Discuss the operation of the liquid cooling system with the aid of an engine cutaway. 3. Discuss operation of air cooled system with aid of a mock-up engine. 4. Demonstrate the service operations and special tools needed: a. Test radiator cap b. Adjust fan belt c. Examine hoses d. Test thermostat e. Pressure test cooling system. 5. Prepare written assignment on cooling system.	Identify and describe the functions of all major cooling system parts. Lab assignment graded by check sheet. Pencil and paper test.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XIV. COOLING SYSTEM		
1. View film on cooling system.	1. Provide film for viewing.	Film: Control Engine Temperature - Chrysler Corporation - 71 Cooling System Care - Car Care Institute
2. Identify and describe functions of all cooling systems.	2. Provide work sheet.	
3. Examine a cutaway model of a liquid cooling system.	3. Discuss operation of liquid cooling system.	Teacher-made cooling system check list.
4. Examine a rock-up of an air cooled engine.	4. Discuss operation of air cooling system.	
5. Perform a preventive check on a liquid cooling system.	5. Supply vehicle for check.	Teacher provide.
	6. Review safety rules.	Auto Mechanics Fundamentals by Stockel Auto Service and Repair by Stockel

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Cooling System
SUB – UNIT :	Thermostat
PERFORMANCE OBJECTIVE NO. :	XIV
TITLE :	Thermostat operation and service

RESOURCES :
1. Film list
2. Text book
3. Thermostat tester

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View film	1. Film: "Engine Temperature Control"	
	2. Auto Mech. Fund. Chapter 4, pp. 75-85	Written Assignment p. 91, Q. 1-19
3. Test Thermostat for opening temperature.	3. Auto Service and Repair Chapter 19, pp. 11-12	

Test Content:

1. Cooling System Fund.
2. Problem Diagnosis
3. Periodic Service

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Cooling System

SUB-UNIT: Thermostat Replacement

PERFORMANCE OBJECTIVE NO.: XIV

TITLE: Remove and Replace Thermostat

RESOURCES:

1. Assign shop engine
2. Assign job sheet
3. Review safety rules

ACTIVITY:

1. Lay out tools.
2. Drain cooling system into drain pan.
3. Remove upper radiator hose.
4. Remove two (2) bolts on thermostat housing and remove housing.
5. Clean old gasket from both the engine and housing.
6. Clean thermostat recess in block.
7. Install new thermostat into block.
8. Place thermostat gasket.
9. Carefully put housing in place and bolt.
10. Connect upper radiator hose.
11. Fill cooling system.
12. Check for leaks.
13. Clean and replace all tools.
14. Practice all safety rules.
15. Clean work area for next assignment.

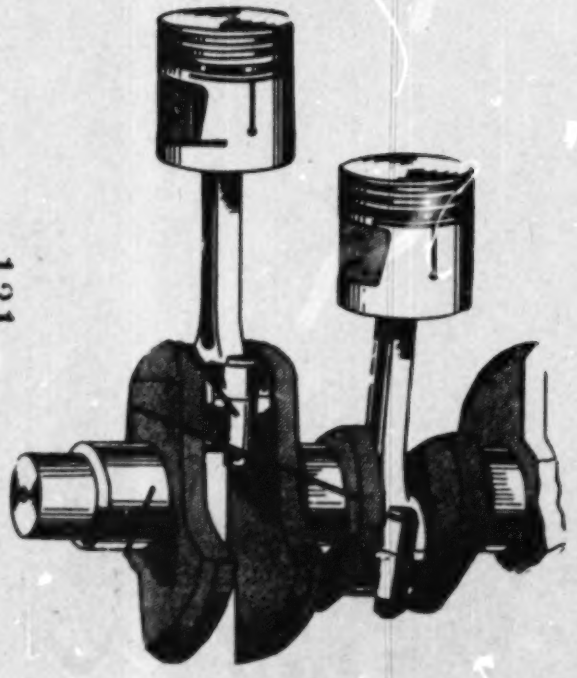
EVALUATION:

The student will replace thermostat to meet instructor's standards. TIME: 45 minutes

J-1

ENGINE OVERHAUL

PISTON



CRANKSHAFT

CONNECTING ROD

121

Unit XV

ENGINE OVERHAUL

1. Fundamentals of Engine Operations

2. Trouble Shooting Procedures

3. Repair Operations

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XV. ENGINE OVERHAUL				
1. Fundamentals of the internal combustion engine must be completely understood before the engine overhaul can be attempted.	1. After being assigned an engine, the student must perform a complete engine overhaul according to Society of Automotive Engineers' standards.	1. Follow step by step procedure of demonstration and theory of disassembly and assembly of engine.	1. Disassemble and assemble with theory explanation of the engine.	1. Pencil and paper test.
2. The four systems in the engine are vital to its operation.		2. Complete written assignment on Engine Fundamentals and Service.	2. Prepare written assignment on Engine Fundamentals and Service.	
3. Trouble shooting an engine one must: use test equipment, the five senses, determine repairs needed, enter parts and make out repair order.		3. Trouble shooting the problems in the engine: a. Test equipment b. Five senses c. Determine repairs d. Order parts e. Make work order	3. Assign engine and explain the procedure involved.	2. Grade on procedure.
4. Every engine repair job must be checked or measured before a good overhaul may be completed.		4. Repair engine a. Service head b. Service piston and cylinder walls c. Service rods and bearings d. Service crankshaft e. Service block f. Service oil gallery	4. Check each step performed by student.	3. Grade on quality of work on quality standards sheet.
		5. Apply all safety standards	5. Review of safety standards.	

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XV. ENGINE OVERHAUL		
1. Use instructor's list of diagnostic procedures correctly.	1. Demonstrate, discuss and hand out list of diagnostic procedures.	Motors Manual
2. Disassemble engine and determine needs.	2. Demonstrate disassembly and how to determine need for engine overhaul.	Chilton Manual
3. Make out parts list.		Factory Shop Manual
4. Prepare engine for assembly.	3. Proper methods of preparing an engine for assembly.	Auto Service and Repair - Stockel
5. Assemble with great care. Tolerances of new parts must be exact.	4. Emphasize need to be exact on tolerances.	Films: "Perfect Circle" "Case of the Slippery Oil" "Down Time" "GM ABC of Engine Repair" "P. C. Dirt Eng. Enemy #1" "Ford Gas Engine Principles" "Details Make The Difference" "Ford Engine 1, 2, 3, 4, 5"
	5. Check work periodically.	
6. Test run engine.	6. Demonstrate pre-lub machine.	
7. Install engine in vehicle and test.	7. Observe testing of engine.	
	8. Grade on quality of work.	
	9. Prepare test.	
	10. Review safety procedures.	

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Engine Overhaul
SUB – UNIT :	Engine Operation
PERFORMANCE OBJECTIVE NO. :	XV
TITLE :	Engine design and operation

RESOURCES :
1. Film list
2. Text book
3. Engine to disassemble and assemble

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View film	1. Film: "Gas Engine Principles"	
2. Disassemble engine (6 or 8 cylinder)	2. Auto Mech. Fund. Chapter 1, pp. 7-20	Written Assignment p. 21, Q. 1-21
3. Assemble engine (6 or 8 cylinder)	3. Chapter 2, pp. 23-49	Written Assignment p. 50, Q. 1-43

Test Content:

1. Engine operation
2. Engine parts

RELATED INSTRUCTION

PROGRAM: Auto Mechanics
UNIT: Engine Overhaul
SUB-UNIT: Engine Valves

PERFORMANCE OBJECTIVE NO.: XV
TITLE: Servicing the Valve Train

RESOURCES:

1. Film list
2. Text book
3. Cylinder head to service

ACTIVITY (STUDENT):	REFERENCE:	EVALUATION:
1. View film	1. Film Bosie Engine Part 1 & 2	Written Assignment: pp. 39 Q. 1-36
2. Remove valves from head	2. Auto Service and Repair Chapter 13 pp. 1-38	
3. Service valves and seats		
4. Install valves in head		

Test Content

Valve service
Procedures

126

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Engine Over Haul

SUB-UNIT: Valve Grinding and Refacing

PERFORMANCE OBJECTIVE NO.: XV

TITLE: Reface valves and grind seats.

RESOURCES:

1. Assign engine head
2. Assign job sheet
3. Review safety rules

ACTIVITY: After completing the related theory proceed as follows:

1. Obtain one cylinder head from parts room
2. Obtain one motors maual
3. Obtain from instructor operating instructions for valve machine
4. Select proper tools
5. Remove all valves following steps in manual
6. Remove all carbon deposits
7. Make all tests and checks as outlined in manual
8. Set up valve equipment with help of instructor
9. After instructor demonstration grind remaining valves
10. Make all tests and checks as outlined in manual
11. Replace valves following manual
12. If all steps are satisfactory, return cylinder head to parts room
13. Clean all tools and equipment
14. Clean work area for next assignment

EVALUATION:

The student will remove grind and replace valves in cylinder head in 3 hours to meet instructors standards.

J-1

SHOP JOB SHEET

PROGRAM: Automotive

UNIT: Engine Overhaul

SUB-UNIT: Fitting Pistion Rings

PERFORMANCE OBJECTIVE NO.: XV

TITLE: Fitting and installing piston rings

RESOURCES:

Auto shop work book - W.H. Krouse
Motor Manual
Tools - Feeler gauges, ring groove cleaner vise, ring compressor, basic hand tools, torque wrench

ACTIVITY: Piston and connecting rod must be removed from engine, cleaned and inspected.

1. Make sure ring grooves are clean.

2. Check ricng set for proper fit be installing in cylinder. Check with feeler gauge for clearance between end of ring.
   (Note: Check specification for proper distance between rings. Clean ring grooves with ring groove cleaner.)

3. Install piston in vise to hold secure. Install bottom ring first. Install middle ring second. Install top ring last.
   (Note: Stager ring grooves to pervent oil comsumption or lose of compression. Manufacturers no longer recommend filling rings ends.)

4. Install ring compressor - making sure ring grooves are staggered.

5. Install piston into cylinder. Make sure piston is installed properly.
   (Note: Oil hole on piston to camshaft side.)

6. Install connecting rod cap. Torque to manufacture spec.

7. Perform same operation for remaining cylinders.

EVALUATION:

Performance test
Oral questions

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Engine Overhaul

SUB-UNIT: Removing Piston and Connecting Rod Assemblies for Inspection

PERFORMANCE OBJECTIVE NO.: XV

TITLE: Removing Piston and Connection Assemblies

RESOURCES:

Motors Manual
Automotive Hand Book - W.H. Crouse
Tools - sockets, ratchet, extension, bolt nut sleeve guide

ACTIVITY: After piston ring ridge is removed, remove piston and rod.

1. Inspect rod and rod caps for cylinder, identifying-both should be numbered. If not, mark with number stamp or paint.
2. Removing #1 rod cap, being careful not to damage cap by prying or hitting with hammer.
3. Push piston and rod upward until piston is out of cylinder.
4. Attach cap and bearing to rod. Inspect carefully for wear or broken parts.
5. Repeat same operation for other cylinders.

EVALUATION:

Performance Test
Oral Question

J-3

SHOP JOB SHEET

PROGRAM: Automotive

UNIT: Engine Overhaul

SUB-UNIT: Check Connecting Rod Bearing Clearance

PERFORMANCE OBJECTIVE NO.: XV

TITLE: Replacing Precision Insert Bearing

RESOURCES:

Motor Manual
Auto Shop Work -
Tools or Material
Plastigage, shim stock, torques, wrench and socket

ACTIVITY: To learn how to install precision insert connecting rod bearings.

1. To check bearing clearance either plastigage or shim stock can be used.

2. When shim stock is used, take off cap and put a ½ inch (12.7 mm) wide strip of 0.0001 inch (0.025) thick shim stock in the cap. Lubricate the shim stock with engine oil, and replace the cap.

3. Tighten the cap nut lightly, note the ease with which the rod may be moved end wise on the crank shift. Then torque to manufactures spec. Then turn crank shaft ¼ turn in each direction. A slight drag should be felt. This indicates the the clearance is satisfactory. Remove cap take out shim. Install cap and retorque.

Using Plastigage

1. Place a strip of plastigage length wise in the center of the bearing cap. Replace cap and tighten the nuts to specified tension.

2. Remove the cap. Note the amount of flattening of the plastigage comparing the width with the scale printed on the plastigage packaging. Make sure marks on within specification. Install cap.

EVALUATION:

Performance test
Oral questions

J-4

SHOP JOB SHEET

PROGRAM: Automotive

UNIT: Engine Overhaul

SUB-UNIT: Cutting Piston Ring Ridge

PERFORMANCE OBJECTIVE NO.: XV

TITLE: Removing Piston Ring Ridge

RESOURCES:

1. Auto Shop Work Book - W.H. Crouse
2. Motors Manual
3. Special Tool - Ridge Reamer

ACTIVITY. After completeing the related theory proceed as follows:

1. Turn crankshaft so that piston move down to permit examination of each cylinder.
   (Note: At the top of each cylinder notice the ridge, if you can catch your fingernail in the ridge the ridge must be removed.)

2. Obtain cylinder ridge reamer, inspect condition for use and safety.

3. Stuff clean shop towel into cylinder to pick metal chips.

4. Place ridge reamer into cylinder - adjust the cutting blade until it is just under ring ridge. Adjust outward to cylinder until slight drag on blade, turn in clockwise motion, keep adjusting tool outward until ring ridge is completely removed.

5. Remove ridge reamer and wipe clean. Repeat the operation for other cylinders.

EVALUATION:

Performance test
Oral qustions

J-5

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Engine Overhaul

SUB-UNIT: Engine Block

PERFORMANCE OBJECTIVE NO.: XV

TITLE: Disassemble Engine and Clean

RESOURCES:

1. Engine block assembly
2. Service sheet
3. Review safety rules

ACTIVITY: Operations to be performed on universal engine work stand.

1. Remove rocker arm caover
2. Remove intake manifold
3. Remove rocker arms and push rods
4. Remove water pump
5. Remove cylinder heads
6. Remove oil pan. (pump reg.)
7. Remove cylinder ridge
8. Remove connectiong rod and pistons (check for identification marks on rods and pistons)
9. Remove harmonic balancer.
10. Remove timing gear cover
11. Remove timing gears or chain
12. Remove crank shaft (check for identification marks on main bearing caps)
13. Remove valve lifters
14. Remove camshaft
15. Clean all parts with correct tools and solvent
16. Store all parts in correct order ready for checking.

EVALUATION:

To be able to disassemble, clean and store engine parts

J-6

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Engine Overhaul

SUB-UNIT: Engine Measurements

PERFORMANCE OBJECTIVE NO.: XV

TITLE: Check Engine Parts for Wear

RESOURCES:

1. Engine Disassembled
2. Service Specifications
3. Review safety rules

ACTIVITY: Measure engine cylinders, pistons, and rings for wear.

1. Measure cylinder out of round and taper.
2. Check piston ring wear in cylinder.
3. Measure piston diameter and ring grooves for wear.

EVALUATION:

Student will determine the amount of cylinder, pistion, and ring wear and check with manufactures specifications.

J-7

RELATED INSTRUCTION

PROGRAM: Auto Mechanics
UNIT: Engine Overhaul
SUB-UNIT: Engine Measurements

PERFORMANCE OBJECTIVE NO.: XV
TITLE: Measure Cylinders, Pistons and Rings

RESOURCES:

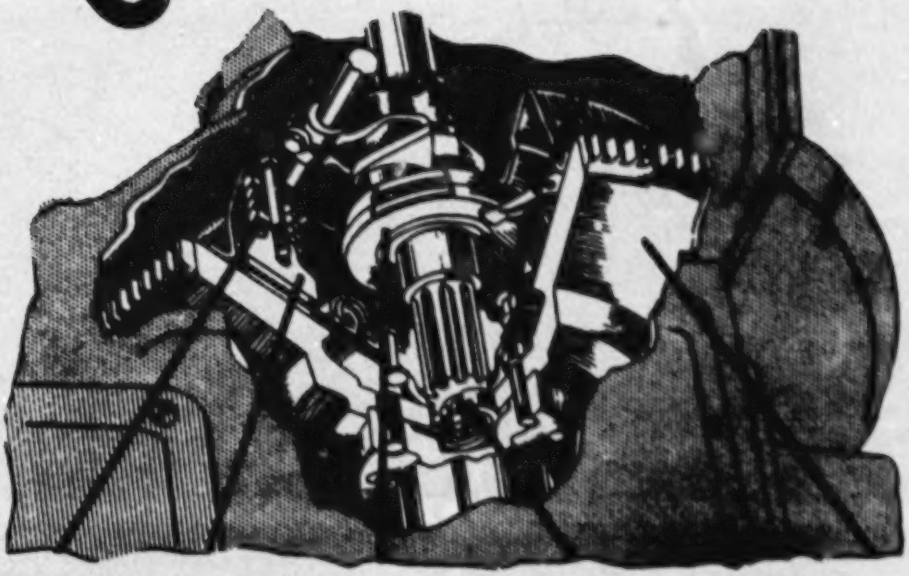
1. Film list
2. Text book
3. Measuring tools

ACTIVITY (STUDENT):	REFERENCE:	EVALUATION:
1. View film	1. Film Piston and Ring Problems	Written Assignment: PP. 33 Q. 1-44
2. Measure part for wear		
3. Review #1 Use of measuring tools	2. Auto Service and Repair Chapter 16 pp. 1-32	

Test Content

1. Engine measurements
2. Wear allowence

CLUTCHES



UNIT XVI

CLUTCH SYSTEMS

1. Types of clutches

2. Clutch adjustments

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XVI. CLUTCH 1. The constant use of the clutch causes wear that must be compensated for to allow the shifting of the transmission. The automobile mechanic should be able to diagnose and adjust or repair clutches.	1. Provided with an automobile, the student will service the clutch by trouble shooting, repairing and adjusting clutches to manufacturer's specifications.	1. Do a written assignment on the clutch. 2. Observe a demonstration. a. Check clutch action for malfunction. b. Adjust clutch pedal clearance. c. Remove and replace clutch disc using clutch aligning tool. 3. Safety rules apply.	1. Prepare a reading and written assignment. 2. Demonstration a. How to check a clutch for malfunction. b. Method for adjusting clutch pedal clearance. c. Proper way to use clutch aligning tool when replacing a clutch disc.	1. A completion test will be given on analyzing clutch operation and service. 2. Replace a clutch disc in a selected vehicle.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XVI. CLUTCHES 1. Complete written assignment. 2. Demonstrate clutch service procedures on mock-up. 3. Check clutch to determine problem. 4. Order parts needed. 5. Repair and adjust clutch.	1. Assign questions at end of chapter. 2. Demonstrate and discuss procedures involving clutch service. 3. Assign vehicle. 4. Purchase parts. 5. Grade procedure and quality of work. 6. Prepare test.	Auto Service and Repair - Stockel Auto Mechanics Fundamentals by Stockel Mock-up Clutch

RELATED INSTRUCTION

PROGRAM : Auto Mechanics
UNIT : Clutch System
SUB – UNIT : Engine Clutches
PERFORMANCE OBJECTIVE NO. : XVI
TITLE : Clutch operation and service

RESOURCES : 1. Text book
2. Clutch on training stand

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. Disassemble and assemble clutch on training stand.	1. Auto Mech. Fund. Chapter 9, pp. 189-197	Written Assignment p. 198, Q. 1-30
	2. Auto Service and Repair Chapter 24, pp. 1-14	Written Assignment p. 16, Q. 1-25
		Test Content: 1. Clutch operation 2. Clutch parts 3. Clutch service

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Clutch System

SUB-UNIT: Adjustment of Clutch

PERFORMANCE OBJECTIVE NO.: XVI

TITLE: Adjust clutch free travel

RESOURCES:

1. Assign vehicle
2. Assign job sheet
3. Review safety rules

ACTIVITY: After completing related theory proceed as follows:

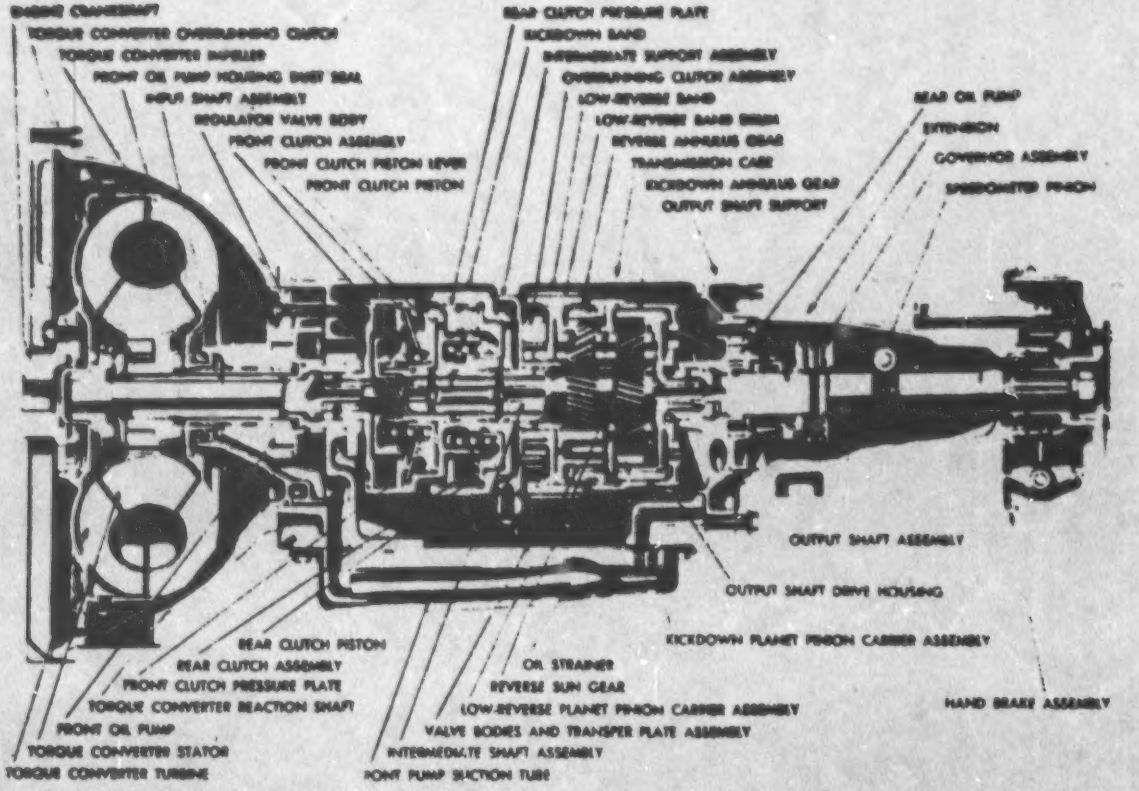
1. Place seat cover in vehicle
2. Move vehicle into work area
3. Determine if adjustment is needed
4. Raise vehicle
5. Determine direction to adjust
6. Select proper tools
7. Adjust to proper free travel
8. Check adjustment for proper free travel
9. If adjustment is right move vehicle to parking area
10. Remove seat cover
11. Observe all safety rules
12. Clean and replace all tools
13. Clean work area for next project

EVALUATION:

The student will adjust to 3/4" free peddle travel. Time 20 minutes.

J-1

TRANSMISSIONS



UNIT XVII

TRANSMISSIONS

1. Standard Transmission

2. Automatic

3. Transmission service

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XVII. STANDARD TRANSMISSION				
1. The transmission is a device to help the engine do its work more efficiently. The transmission makes it possible to select the proper gear ratio to allow the engine to do a particular job at a particular time.	1. Assigned a transmission, the student will view demonstration by instructor, then dismantle and reassemble the assigned transmission according to instructor's standards.	1. View demonstration 2. Pick up unit instruction sheet. 3. Dismantle, check and reassemble transmission while making out unit sheet. 4. All safety precautions apply.	1. Demonstrate, disassemble and reassemble of standard transmission. 2. Pass out unit sheet. 3. Assign student standard transmission. 4. Review safety points.	1. Pen and pencil test.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XVII. STANDARD TRANSMISSIONS		
1. View demonstration.	1. Demonstrate and discuss standard transmission.	Auto Mechanics Fundamentals - Stockel
2. With check list, dismantle and disassemble transmission.	2. Assign transmission in lab.	Motors Repair Manual
	3. Pass out check sheet.	Chilton Repair Manual
3. Diagnose transmission problem in vehicle.	4. Assign vehicle.	Auto Service and Repair by Stockel
4. Repair transmission and test.	5. Check proficiency of work performed and grade.	
	6. Prepare test.	
	7. Review safety procedures.	

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XVII (B). AUTOMATIC TRANSMISSION				
1. The automatic transmission will perform the same job as the standard transmission only accomplish it with no shifting by driver.	1. Given the theory and proper procedure, the student will dismantle and reassemble, checking all parts and identifying them to the satisfaction of the instructor.	1. Classroom theory and demonstration on procedure.	1. Discuss theory and proper procedures of working on the automatic transmission from Auto textbook.	1. Pencil and paper test.
2. The fluid coupling in the automatic transmission makes it extremely hard to put undo strain on the engine or drive train.		2. With check list, dismantle, check and identify on the check list and reassemble transmission.	2. Assign student transmission.	2. Grade unit check list and procedures.
		3. Apply all safety rules.	3. Hand out unit check list.	
			4. Review all safety precautions.	

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XVII (B). AUTOMATIC TRANSMISSION		
1. Take part in demonstration and discussion on the automatic transmission.	1. Lead demonstration and discussion.	Motors Repair Manual
2. Dismantle, check and identify parts on check list.	2. Assign transmission and check sheet.	Chilton Repair Manual Auto Service and Repair - Stockel
3. Reassemble and adjust.	3. Check finished lab assignment and grade.	Auto Mechanics, 6th Edition - Crouse
4. Obtain instructor approval of satisfactory performance.	4. Prepare test.	Auto Mechanics Fundamentals by Stockel
	5. Review safety procedures.	

RELATED INSTRUCTION

PROGRAM : Auto Mechanics
UNIT : Transmissions
SUB – UNIT : Standard Transmission
PERFORMANCE OBJECTIVE NO. : XVII
TITLE : Standard Transmission Operation and Service

RESOURCES : 1. Text book
2. Standard Transmission

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
	1. Auto Mech. Fund. Chapter 10, pp. 199-211	Written Assignment p. 212, Q. 1-30
2. Disassemble and assemble a standard transmission.	2. Auto Service and Repair Chapter 25, pp. 1-25	Written Assignment p. 29, Q. 1-36

Test Content:

1. Transmission Fundamentals.
2. Transmission Construction.
3. Transmission Service.

147

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Transmissions

SUB-UNIT: Tail shaft oil seal

PERFORMANCE OBJECTIVE NO.: XVII

TITLE: Replace tail shaft oil seal

RESOURCES:

1. Assign vehicle
2. Assign job sheet
3. Review safety rules

ACTIVITY: After completing related theory proceed as follows:

1. Place seat cover in vehicle
2. Move vehicle into work area
3. Raise vehicle on lift
4. Drain 1 Qt. fluid from transmission
5. Draw seal puller from tool crib
6. Select tools
7. Remove drive shaft
8. Pull out old seal with puller
9. Clean housing for new seal
10. Install new seal properly
11. Install drive shaft
12. Lower vehicle
13. Add back 1 Qt. fluid
14. Check for leaks
15. Observe all safety rules
16. If all checks pass inspection place vehicle in parking place
17. Clean and replace all tools
18. Clean work area for next project

EVALUATION:

The student will replace the tail shaft oil seal of an automatic transmission. Learning time 1 hour.

J-1

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Standard Transmissions

SUB-UNIT: Assembly Standard Transmission

PERFORMANCE OBJECTIVE NO.: XVII

TITLE: Transmissions

RESOURCES:
1. Assign transmission
2. Issue job sheet
3. Class demonstration
4. Safety precautions
5. Special tools - snap-ring, pliers, and magnet
6. Manufactures manual
7. Information sheet

ACTIVITY: After completing related theory section, proceed to assemble transmission. The following steps are a general guide. Concult manual for detail information.

1. Install reverse idler gear and shaft. Apply a heavy coating of wheel bearing grease to hold needle bearings in place while installing the reverse idler gear shaft assembly. Remember thrust washers are mounted on opposite ends of the gear to provide the correct end play.

2. Install counter shaft and gear assembly same as step 1. Be sure all needle bearings are held in place with heavy coating of grease. Before sliding the shaft into the case check position of thrust washer - note tabe on washers fit to the slotted section in the case.

3. Install retainers for both the idler shaft and counter gear shaft.

4. Slide following parts on to the out put shaft 1st gear, 2nd gear, and 3rd gear and syncroniser assembly check manual be sure syncroniser parts are in proper order.

5. Slide complete assembly into transmission. Be sure shifter forks are in place and in correct position.

6. Install the pinion drive shaft (needle bearing in place). Install the same way it was removed the section with the omitted teeth must be turned down to clear counter gear assembly.

7. Install bearing snap-rings, front pinion shaft, and rear bearing output shaft.

8. Install case extension cover.

9. Install pinion retainer.

10. Call instructor.

EVALUATION:

Performance test
Oral questions on operation of drive line during gear change ratios.

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Standard Transmissions

SUB-UNIT: Disassembly Standard Transmission

PERFORMANCE OBJECTIVE NO.: XVII

TITLE: Transmissions

RESOURCES:
1. Assign Transmission
2. Issue Job Sheet
3. Class Demonstration
4. Special Tools - snap-ring pliers and magnet
5. Safety Precautions
6. Cards to Label Parts
7. Mfg. Manual

ACTIVITY: After completing the related theory section, proceed with the following:

General Guide - Consult Mfg. Manual for Details

1. Mount transmission in work stand.
2. Remove the following attaching parts from transmission:
   a. Transmission cover top or side
   b. Transmission pinion retainer
   c. Transmission rear extension case
3. Remove snap-ring from front drive pinion shaft bearing.
4. Rotate drive pinion. (Note: Three teeth omitted to small gear.) Turn omitted teeth to bottom. This will allow clearance for the drive pinion shaft past the counter gear.
5. Remove snap-ring from rear output shaft bearing and remove output shaft assembly.
6. Label individual parts
7. Remove main counter gear shaft before driving out shaft. Check and remove any retainers or snap-rings. Be careful not to lose needle bearings.
8. Drive out shaft reverse idler.
9. Label remainder of parts. Call instructor.

EVALUATION:

Performance test
Oral questions from the instructor on inspection
Specifications and recognition of defective parts

RELATED INSTRUCTION

PROGRAM: UNIT: Auto Mechanics SUB-UNIT: Automatic Transmission Torgue Converters PERFORMANCE OBJECTIVE NO.: XVII TITLE: Operation of Torgue Converter	RESOURCES: 1. Text 2. Mock-up Converter

ACTIVITY (STUDENT):	REFERENCE:	EVALUATION:
1. Disassemble and assemble a torgue converter	Auto Mechanics Fundamentals Chapter 12, pp. 223-250	Written Assignment p. 250, Q. 1-37

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: XVII

SUB-UNIT: Automatic Transmission

PERFORMANCE OBJECTIVE NO.: XVII

TITLE: Remove and Replace Automatic Transmission

RESOURCES:

1. Tools
2. Service Manual
3. Safety

ACTIVITY: After satisfactory completion of all related training, proceed as follows:

1. Place seat cover on front seat of vehicle.
2. Move vehicle into work area.
3. Select proper service manual and chapter.
4. Select proper tools.
5. Raise hood.
6. Place fender covers.
7. Disconnect and remove everything necessary under the hood.
8. Position lift arms and raise vehicle.
9. Remove driveshaft.
10. Disconnect and remove all necessary parts for transmission (see service manual)
11. Remove transmission following steps as outlined in service manual.
12. Perform all checks and tests per service manual.
13. Make all bench adustments per service manual.
14. Install transmission in vehicle.
15. Connect all parts following service manual.
16. Install drive shaft.
17. Check all work and lower vehicle.
18. Connect all under hood connections.
19. Make all tests, checks, and adjustments.
20. Return all tools and materials to proper place and close hood.
21. Remove vehicle and clean work area.

EVALUATION:

Student will remove and replace automatic transmission in 3 hours at 100% accuracy.

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Transmissions

SUB-UNIT: Automatic Transmission

PERFORMANCE OBJECTIVE NO.: XVII

TITLE: Disassemble, check and reassemble auto. trans.

RESOURCES:

1. Tools
2. Service Manual
3. Transmission
4. Safety

ACTIVITY: After satisfactory completion of all related work proceed as follows:

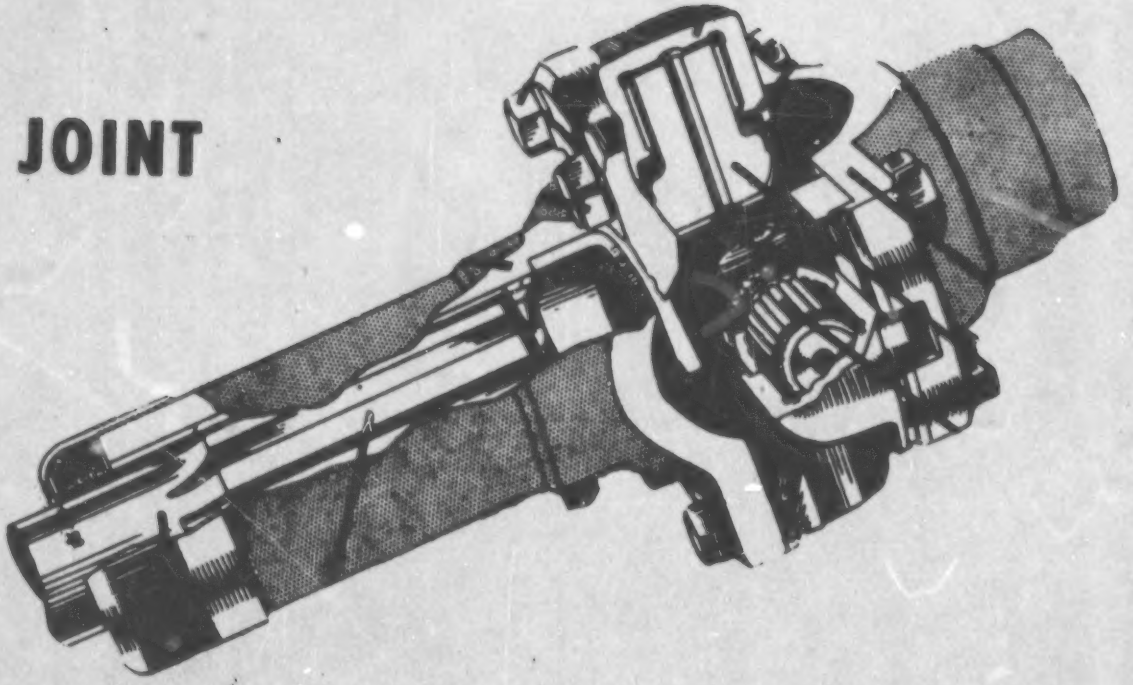
1. Obtain transmission from instructor
2. Select tools and proper service manual
3. Disassemble transmission per service manual
4. Identify all parts and their function
5. Perform all test and checks
6. Reassemble transmission per service manual
7. Perform all bench tests
8. Be checked out by instructor
9. Return all tools and clean work area
10. Get checked off on progress chart

EVALUATION:

Student will satisfactorily disassemble, check, reassemble, and bench test automatic transmission in 8 hours. (Learning time 20 hours)

J-5

UNIVERSAL JOINT



151

UNIT XVIII

DRIVE LINE

1. Types of drive lines

2. Universal joints

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XVIII. DRIVE LINES				
1. The universal joint and drive line are very essential to complete the power flow in a front engine rear wheel drive vehicle.	1. Given the proper tools and equipment, the student will service a drive shaft universal joint according to instructor's standards.	1. View instructor's demonstration and discussion on universal joints and procedures. 2. Select special tools and service drive shaft and universal joint. 3. Follow job sheet. 4. Observe all safety precautions.	1. Lead discussion and demonstration. 2. Make job sheet. 3. Observe student procedures on unit. 4. Discuss safety precautions.	Grade job sheet on replacing universal joint on drive shaft.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XVIII. DRIVE LINES 1. View demonstration on universal joints. 2. Participate in discussion on universal joints. 3. Select special tools for drive line service. 4. Remove and replace a universal joint.	1. Conduct demonstration. 2. Lead discussion. 3. Provide special tools. 4. Observe service procedure. 5. Observe all safety precautions.	Mock-up (drive shaft). Motors Manual Auto Mechanics Fundamentals by Stockel Auto Service and Repair by Stockel Film: Drive line by Ford

RE ED INSTRUCTION

PROGRAM : Auto Mechanics
UNIT : Drivelines
SUB – UNIT : Driveline Construction
PERFORMANCE OBJECTIVE NO. : XVIII
TITLE : Drive Shaft and Universal Joint

RESOURCES : 1. Film list
2. Text book

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
1. View film	1. Film: "Drive Line Principles"	Written Assignment p. 259, Q. 1-20
	2. Auto Mech. Fund. Chapter 13, pp. 251-258	
3. Remove and replace U joint on drive shaft.	3. Auto Service and Repair Chapter 27, pp. 1-13	Written Assignment p. 15, Q. 1-21
		Test Content: 1. Drive line construction. 2. Drive line service.

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Drive Line

SUB-UNIT: U-joint

PERFORMANCE OBJECTIVE NO.: XVIII

TITLE: Replace Front U-joint

RESOURCES:

1. Furnish drive shaft with u-joints
2. Assign job sheet
3. Review safety rules

ACTIVITY: After completing related theory proceed as follows:

1. Select work area with vise
2. Procure special tools
3. Place drive shaft in vise
4. With special tool remove U-joint
5. Press in new joint with vise
6. Obtain approval of instructor
7. Clean and return tools
8. Return drive shaft
9. Clean work area for next project

EVALUATION:

The student will replace front U-joint with 100% accuracy. Learning time 1 hour.

J-1

DIFFERENTIAL

UNIT XIX

DIFFERENTIAL

1. Standard type

2. Non-Slip type

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XIX. DIFFERENTIAL				
1. The differential is the final unit the power flows through before going to the wheels. It also allows one wheel to turn faster than the other on turns.	1. Assigned a vehicle, the student will prepare the vehicle to perform differential repair and disassemble according to Society of Automotive Engineers' standards.	1. View demonstration and class discussion on the differential. 2. Jack vehicle and place on safety stands. 3. Remove the differential according to instructor's unit job sheet. 4. Repair differential and adjust. 5. Apply all safety standards.	1. Give demonstration and lead discussion. 2. Assign vehicle. 3. Hand out unit job sheet. 4. Safety procedure review.	Observe student activity, check work and unit job sheet and grade.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
VIII. DIFFERENTIAL 1. Place vehicle on jack stands. 2. Remove differential and disassemble with special tools. 3. Repair differential to meet manufacturer's specifications.	1. Lead discussion and demonstration. 2. Assign vehicle. 3. Supply job sheet. 4. Observe service procedure. 5. Apply all safety standards.	Auto Mechanics Fundamentals by Stockel Teacher-made job sheet. Auto Service and Repair - Stockel Motors Auto Repair Manual

RELATED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Differential
SUB – UNIT :	Differential Carrier
PERFORMANCE OBJECTIVE NO. :	XIX
TITLE :	Rear Axle and Differential

RESOURCES :
1. Film list
2. Practice differential

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
	1. Film: "Rear Axle Principles"	Written Assignment p. 273, Q. 1-29
	2. Auto Mech. Fund. Chapter 14, pp. 261-273	
3. Disassemble and assemble a differential.	3. Auto Service & Repair Chapter 28, pp. 1-29	Written Assignment p. 31, Q. 1-32
		Test Content: 1. Differential operation. 2. Differential construction. 3. Differential service.

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Differential

SUB-UNIT: Pinion oil seal

PERFORMANCE OBJECTIVE NO.: XIX

TITLE: Remove and replace Pinion Oil Seal

RESOURCES:

1. Assign vehicle
2. Issue job sheet
3. Review safety rules

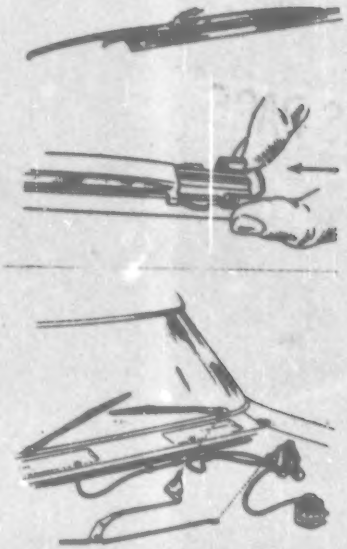
ACTIVITY: After completing related theory procced as follows:

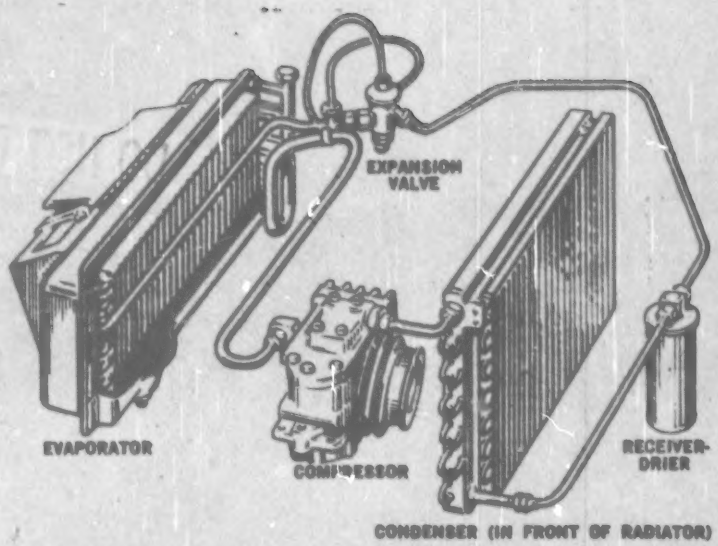
1. Place seat cover in vehicle
2. Move vehicle into work area
3. Select tools
4. Raise vehicle
5. Observe all safety rules
6. Remove drive shaft
7. Remove pinion flange
8. Remove pinion seal with special tool
9. Install new oil seal
10. Install pinion seal with special tool
11. Check on pinion flange nut torque
12. Torque nut to specified torque
13. Install new cotter pin
14. Install drive shaft
15. Check for leaks
16. Lower vehicle
17. Clean and replace all tools
18. With instructors approval place vehicle in parking area.
19. Remove seat cover
20. Clean work area for next project

EVALUATION:

The student will replace differential pinion seal to meet instructors standards. Learning time 4 hours.

AUTOMOTIVE ACCESSORIES





UNIT XX

AUTOMOTIVE ACCESSORIES

1. Electrically operated

2. Vacuum operated

3. Air conditioning

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XX. AUTOMOTIVE ACCESSORIES 1. The automotive accessories unit will give the student the chance to service all the auto accessories and become proficient at this skill.	1. Assigned a vehicle, the student will service a simple malfunction in the accessories unit to meet instructor's standards.	1. Check circuits and fuses. 2. Check vacuum to accessories. 3. Replace wiper blades. 4. Aim head lamps. 5. Replace bulbs. 6. Apply all safety rules.	1. Demonstrations: a. Aim head light b. Service signals c. Check power windows and seats. d. Replace defective gauges and warning units. e. Repair horn f. Service wipers.	1. Inspect and grade this unit.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XX. AUTOMOTIVE ACCESSORIES		
1. Check fuse block for blown fuses.	1. Provide vehicle to check fuse block.	Motors Service Manual
2. Check vacuum to accessories.	2. Supply vehicle for vacuum supply check.	Auto Mechanics Fundamentals - Stockel pp. 407-424
3. Replace wiper blades.	3. Supply vehicle and blades.	Auto Service and Repair by Stockel
4. Replace a blown lamp.	4. Observe service procedure.	
5. Aim headlights to requirements.	5. Observe all safety rules.	

RE ED INSTRUCTION

PROGRAM :	Auto Mechanics
UNIT :	Automotive Accessories
SUB – UNIT :	Lighting System
PERFORMANCE OBJECTIVE NO. :	XX
TITLE :	Wire up directional circuit

RESOURCES :
1. Text book
2. Light simulator

ACTIVITY (STUDENT)	REFERENCE :	EVALUATION :
	1. Auto Mech. Fund. Chapter 19, pp. 400-403	Written Assignment p. 406, Q. 68-73
2. Wire directional light circuit on simulator.	2. Auto Service & Repair Chapter 6, pp. 1-12	Written Assignment p. 12, Q. 1-38

Test Content:

1. Electrical Fund.
2. Wiring Symbols
3. Loght Circuits

170

SHOP JOB SHEET

PROGRAM: Auto Mechanics

UNIT: Automotive Accessories

SUB-UNIT: Dome Light

PERFORMANCE OBJECTIVE NO.: XX

TITLE: Replace Dome Light Bulb

RESOURCES:

1. Assign vehicle
2. Issue job sheet
3. Review safety rules

ACTIVITY: After completing related theory procced as follows:

1. Place seat cover in vehicle
2. Move vehicle into work area.
3. Remove light's plastic cover (procedure in manual).
4. Remove bulb.
5. Test with circuit tester to determine if wire is shorted.
6. If circuit tests good install new bulb.
7. Replace plastic cover.
8. Place vehicle in parking area.
9. Remove seat cover.
10. Clean work area for next project.

EVALUATION:

The student will replace dome light bulb.
100% accuracy
Learning time 20 minutes.

26

---BUSINESS MANAGEMENT---

UNIT XXI

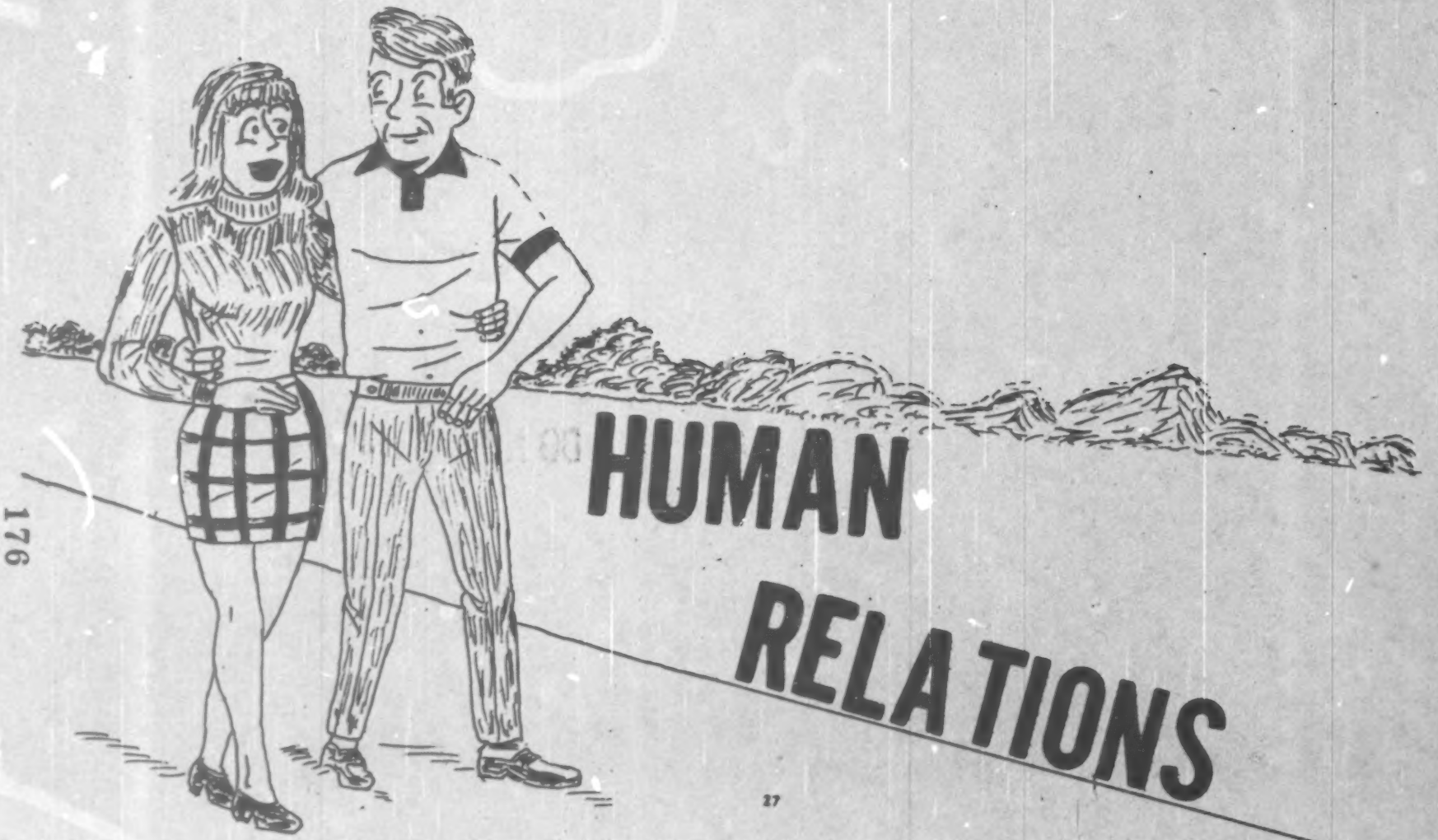
BUSINESS MANAGEMENT

1. Bookkeeping

2. Cost Analysis

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XXI. BUSINESS MANAGEMENT 1. Business management is very important for the vocational auto student so he may learn skills involved in keeping books, to make Federal reports, income tax, and to tell if he is making a fair profit or not.	1. Presented with a service station learning packet, the student will read instruction booklet, enter problems in proper ledger and compute correct answers to comply with the master outline.	1. Receive proper instruction from bookkeeping teacher. 2. Read each problem and enter in the proper ledger in the correct space. 3. Compute a day-by-day ledger and end-of-month report.	1. Suggested correlation between Auto and Business Education Departments one period per day for four weeks. Use Packet #_____ for Service Station Management. 2. IRS person to visit class as reference.	1. Standardized test furnished with packet.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
XXI. BUSINESS MANAGEMENT		
1. Can use the following journal and/or ledger: a. Combination Journal b. Daily Summary Sheet c. General Ledger d. Accounts Receivable Ledger.	1. Correlate program with Business Education as a mini course.	Rogers Service Station - Practice Set, 2nd Edition - South-Western Publishing Co.
2. Can follow narrative of transactions for the month.	2. Issue student's Practice Sets.	Note to Instructor: To impliment this mini course, this Practice Set is a must. Suggested for Auto II the third or fourth marking period.
3. Can make end of month summary.	3. Check day by day progress and furnish individual and/or group discussion on problem areas.	
	4. Auto instructor will assist Bookkeeping teacher in class.	
	5. Give standardized test in Teacher's Practice Set.	


HUMAN
RELATIONS

SKILL-CONCEPT-VALUE	BEHAVIORAL OBJECTIVE	SUGGESTED LEARNING ACTIVITIES	TEACHER RESOURCES NEEDS	SUGGESTED EVALUATION
XXII. HUMAN RELATIONS 1. The automobile mechanic should have a pleasing personality and good personal hygiene habits in dealing with employer, employees, and customers and be aware of his responsibilities as an employee in the automotive field.	1. Presented with the proper instructions, the student will discuss the importance of his attitude and responsibilities as an employee in the automotive field.	1. Participate in human relations discussion. 2. Observe a demonstration. Play roles or discuss how to handle each situation: a. Applying for a job. b. Handling customers. c. Handling employee complaints. d. Explaining mistakes to the employer.	1. Lead discussion on human relations and encourage class participation. 2. Demonstration. How to handle difficult human relations: a. Applying for a job. b. Handling an irate customer. c. Handling a complaining fellow employee. d. Handling a know-it-all customer. e. Explaining a serious mistake to the employer. 3. Co-op coordinator speak to class.	Paper and pencil test made up by teacher.

OBJECTIVE	LESSON OR UNIT PLAN	BIBLIOGRAPHY OF MATERIAL RESOURCE
UNIT. HUMAN RELATIONS		
1. Show an interest in the human relation discussion by his participation.	1. Lead discussion.	Information sheet.
2. Display enthusiasm in the following situations of role playing: a. Applying for a job. b. Handling customers. c. Handling employee complaints. d. Explaining mistake to the employer.	2. Observe the attitude during role playing.	
	3. Oral test.	Teacher-made test.

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Auto Service and Repair,- Stockel,- Published by Goodheart-Wilcox Co Inc.,- So. Holland, Ill. 60473

Automotive Mechanics 6th edition,- Crouse,- Published by McGraw-Hill Co,,-Philadelphia, Penn. 19139

Auto Tune-up Principals & Procedures Text Book,- Ignition Manufacturers Institute, P.O.Box 1406 Evanston, Ill. 60204

Chilton's Automotive Service Manual,- Published by Chilton Co.,- 56th and Chestnut Streets Philadelphia, Penn. 13139

Motors Auto Repair Manual,- Published by Motor's Inc.- New York, N.Y. or Local Book Store

Motor Service's Automotive Encyclopedia,- Published by Goodheart-Wilcox Co.,- 123 W. Tuft Drive, So. Holland, Ill. 60473

Car Service by Chek-Chart,- Published by H.M. Gousha Co.,- 222 W. Adams St., Chicago, Ill. 60606

VT.-ERIC Set. VT 011 267 Modular Instruction Automobile Mechanics-Twin State Information Center.

The Auto Book Program,- Crouse,- Published by McGraw-Hill Co.,- Philadelphia, Penn. 19139

Automotive Lighting Demonstration Board,- by Electronic Kits Supply Co.,- 1261 S. Boyle,- Los Angeles, California. 90054

179

AUTOMOBILE ACCESSORIES	SOURCE
Seeing For Safety (lighting and glass)	Car Education Institute
Air Conditioning Principles	Ford
Auto Temperature Control (Air Conditioning)	68 - Chrysler
Auto Temperature Control	71 - Chrysler
Air Conditioning Control	69 - Chrysler
Air Conditioning	69 - Chrysler
BRAKE SYSTEM	
Evolution of Brakes	Ford
Brake Care for Safety	Car Education Institute
Fundamentals of Drum Brake Service	Bear
Fundamentals of Drum Brake Service	Bear
Drum Brake Service	69 - Chrysler
Disc Brake Service	69 - Chrysler
Disc Brake Service	72 - Chrysler
CHARGING SYSTEM	
Regulation and the Charging Circuit	Delco-Remy
Generator and New Charging Circuit	Delco-Remy
Charging System Diagnosis	Ford
Charging System Diagnosis Part II	69 - Chrysler
COOLING SYSTEM	
Cooling System Care for Safety	Car Education Institute
Cooling System Diagnosis	Ford
Engine Temperature Control	68 - Chrysler
Controlling Engine Temperature	71 - Chrysler

DRIVE LINE AND DIFFERENTIAL	**SOURCE**
Rear Axle and Drive Line Principles	Ford
Servicing the Rear Axle	69 - Chrysler
Rear Axle Part II	71 - Chrysler
ELECTRICAL SYSTEM	
Fundamentals of Electricity	Ford
Electric Power for Safety	Car Education Institute
Electrical Wiring	68 - Chrysler
Electrical Diagrams Part II	Ford
Introduction to the Auto Electrical System	Delco-Remy
Its Easy to be an Expert (Battery Service)	Delco-Remy
EMISSION CONTROL	
Emission Control	Ford
C.A.P. System	68 - Chrysler
Evaluation of a Clean Air System	71 - Chrysler
ENGINE	
Gas Engine Principles	Ford
Diesel Engine	Ford
Details make the difference	Sealed Power Corp.
Engine Basic 1,2	Ford
Engine Basic 3,4,5	Ford
Piston and Ring Problems	Ford
FUEL SYSTEM	
Fuel System Principles	Ford
Filtration for Safety	Car Education Institute
Carburetor Service	68 - Chrysler
Double Barrel Carburetor	69 - Chrysler

1811

FUEL SYSTEM	**SOURCE**
Four Barrel Carburetor	69 - Chrysler
IGNITION SYSTEM	
20,000 Volts Under the Hood	Delco-Remy
Ignition System Principles	Ford
Ignition System (Electronic)	72 - Chrysler
Preformance for Safety	Car Education Institute
Engine Performance	68 - Chrysler
Ignition System Analysis	69 - Chrysler
Analyzer Diagnosis and Testing	Ford
LUBRICATION SYSTEM	
Facts about Filters	Perolator
ORIENTATION	
Auto Biography	G.M.
What it Takes to Make Your Car	G.M.
Trucks Work for Us	G.M.
STARTING SYSTEM	
Storage Batteries	Exide
The Cranking Circuit	Delco-Remy
PREVENTATIVE MAINTENANCE	
Cure the Cause	71 - Chrysler
Safety is no Accident	71 - Chrysler
Safe for the Road	68 - Chrysler

122

STEERING AND SUSPENSION SYSTEM	SOURCE
Conventional Steering and Suspension	Ford
Suspension Service Round up	68 - Chrysler
Power Steering	69 - Chrysler
TIRES AND WHEELS	
Tire Care for Safety	Car Education Institute
Tire Problem Analysis	Ford
Fundamentals of Wheel Alignment	Bear
TRANSMISSIONS (AUTOMATIC)	
Torque Flite Transmission	68 - Chrysler
Torque Flite Diagnosis	71 - Chrysler
Shift and Linkage Adjustment	71 - Chrysler
Auto Transmission Diagnosis	Ford
GENERAL INTEREST	
68 Service Features	68 - Chrysler
69 Service Features	69 - Chrysler
Performance (Engine Setup)	69 - Chrysler
Body Sealing Diagnosis	68 - Chrysler
Fuels, Lubricants and Fluids	71 - Chrysler
Facts and Fixes (Engine Performance)	72 - Chrysler

35mm Filmstrips Available on Free Loan

From: Federal-Mogul Service

Automobile Engine Bearings, Part I - Color - Sound - 19 min.

Automobile Engine Bearings, Part II - Color - Sound - 30 min.

Automobile Wheel Bearings, Part I - Color - Sound - 15 min.

Automobile Wheel Bearings, Part II - Color - Sound - 15 min.

Automobile Wheel Bearings, Part III - Color - Sound - 15 min.

Automobile Wheel Bearings, Part IV - Color - Sound

Contact: Division of Federal-Mogul Corporation
Mr. Michael Callihan, Supervisor of Advertising
P. O. Box 1966
Detroit, Michigan 48235

From: Dana Parts Company

Diagnose it First - Color - Sound

Diagnose Excessive Oil Consumption and Engine Overhaul Procedure

Prescription for Longer Valve Life - Color - Silent - 30 minutes

Preventing Oil Loss Through the Valve Guides - Color - Silent - 15 minutes

That High Power Top Inch - Color - Silent - 30 minutes

From: Dana Parts Company
Librarian, School Assistance
Technical Service Department
Hagerstown Distribution Center
P. O. Box 500
Hagerstown, Indiana 47346

184

16mm Films Available on Free Loan Basis

From: Ford Motor Company

The American Road - Sound - Color - 38 Min.

Auto Mechanic and Technician - Sound - Color - 23 Min.

Smith System of Space Cushion Driving - Sound - 18 Min.

The Automobile Engine - Color - Sound - 19 Min.

A Car is Born - Color - Sound - 28 Min.

No Accident - Color - Sound - 23 Min.

So, You Want to Buy a Good Used Car - Sound - Color - 15 Min.

World of Henry Ford - Color - Sound - 35 Min.

Contact: Ford Motor Company, Film Library
The American Road
Dearborn, Michigan

From: Dana Corporation

Dirt-Enemy Number 1 - Sound - Color - 10 Min.

Background for Leadership - Sound - Color - 30 Min.

Case of the Slippery Oil - Sound - Color - 40 Min.

Contact: Dana Parts Company
Technical Service Department
Hagerstown Distribution Center
P. O. Box 500
Hagerstown, Indiana 47346

From: General Motors Corporation

Safety First-Second-Third - Sound - Color - 30 Min.

A.B.C. of Automobile Engines - Sound - Color - 21 Min.

A.B.C. of Internal Combustion - Sound - Color - 13 Min.

A.B.C. of Diesel Engine - Sound - Color - 20 Min.

Changing Architecture of the Automobile Body - Sound - Color - 31 Min.

Temperatures Made to Order - Sound - Color - 23 Min.

Up From Clay - Sound - Color - 26 Min.

Where Mileage Begins - Sound - 19 Min.

Contact: General Motors Corporation
Public Relations Staff Film Library
General Motors Building
Detroit, Michigan 48202

From: Mercedes-Benz Films

The Extra Margin - Sound - Color - 11 ½ Min.

At Your Service - Sound - Color - 11 Min.

Contact: Mercedes-Benz Films
Department of Creativision, Inc.
295 West 4th Street
New York, New York 10014

From: Champion Plug Company

The Spark of Power - Sound - Color - 14 Min.

Spark in Time on the Firing Line - Sound - Color - 22 Min.

Contact: Champion Spark Plug Company
Film Department
900 Upton Avenue
Box 910
Toledo, Ohio 43601

186

Periodicals

The New Magic Circle, published four times a year and available free by writing Magic Circle, Dana Corporation, P. O. Box 500, Hagerstown, Indiana 47346.

Suggested References on Subscription Basis

The following are available on a subscription basis. Initially the instructor will receive complete volumes of the books. Additions, deletions and changes are made as necessary and mailed to the instructor. Subscriptions may be purchased through your local Delco Jobber or by writing the company.

Number 9 Carburetor Parts and Service Manual, Delco Rochestar, United Delco Co., G. M. Building, 3044 West Grand Boulevard, Detroit, Michigan 48202.

Number 1.2 Electrical Service Manual, Delco Remy, United Delco Company, G.M. Building, 3044 West Grand Boulevard, Detroit, Michigan 48202.

Pamphlets and Charts Available Free or at Low Cost to Automotive Mechanics Instructors

Ammco Brake Service Equipment and Tools for a Vocational Class of 20 Students, 5 page list of recommended equipment and instrucitonal materials, available from Ammco Tools, Inc., 2100 Commonwealth Avenue, North Chicago, Illinois 60064.

Ammco Engine Repair Tools for a Automotive Education Class of 20 Students, 2 page list of recommended tools and instructional materials, available free from Ammco Tools, Inc.,2100 Commonwealth Avenue, North Chicago, Illinois, 60064, 1969.

Ammco Service Bulletin- Don't be afraid of Brake Discs, 2 pages, Ammco Tools, Inc., 2100 Commonwealth Avenue, North Chicago, Illinois 60064.

Ammco Service Bulletin - Drum Diameter Sizes for Passenger Cars, 1 page chart, available free from Ammco Tools, Inc., 2100 Commonwealth Avenue, North Chicago, Illinois 60064.

Ammco Wheel Alignment and Wheel Balancing Tools and Equipment for a Automotive Education Class of 20 Students, 3 page list of recommended tools, equipment, and instructional materials, available free from Ammco Tools, Inc., 2100 Commonwealth Avenue, North Chicago, Illinois 60064.

Brake Facts for the Expert Installer, 35 pages, available from Marshall-Eclipse Division, Bendix Corporation, Troy, New York, Cleceland, Tennessee.

Brake System Service Manual, Service Manual 8-200-1 May, 1968, 136 pages, available from Bendix Corporation, Automotive Service Division, South Bend, Indiana 46620.

Crank case and Exhaust Emission Systems, 13 page service manual, A.C. Spark Plug Division, General Motors Corporation, Public Relations Staff, General Motors Building, Detroit, Michigan 4°202, 1964.

Diesel the Modern Power, By Ralph A. Richardson, 32 pages, available from General Motors Corporation, Public Relations Staff, General Motors Building, Detroit, Michigan 48202, 1964.

Electricity and Wheels, 32 pages, available free from Public Relations Staff, General Motors, Detroit, Michigan 48202, 1953,

Fuel Pump sShop Manual, 28 pages, A.C. Spark Plug Division, General Motors Corporation, Flint, Michigan 48202, 1958.

Fundamentals of Disc Brake Service, 47 pages available from Bear Manufacturing Company, Rock Island, Illinois, 1969.

Fundamentals of Drum Brake Service, 54 illustrations, available from Bear Manufacturing Company, Rock Island, Illinois, 1969.

Fundamentals of Wheel Alignment, 86 illustrations, available free from Bear Manufacturing Company, Rock Island, Illinois 61201, 1968.

How Gas is Converted to Power, 17" x 22" chart, available free from Educational Affairs Department, Ford Motor Company, The American Road, Dearborn, Michigan.

How Hydraulic Brakes Operate, 17" x 22" chart, available free from Ford Motor Company, Educational Affairs Department, hte American Road, Dearborn, Michigan.

How the Carburetor Works, 17" x 22" chart, available free from Ford Motor Company, Educational Affairs Department, the American Road, Dearborn, Michigan.

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Hydra-matic 400 Principles of Operation, Second Edition, 57 pages, available free from Service Department, Hydra matic Division, General Motors Corporation, Willow Run, Ypsilanti, Michigan 48197, 1968.

Hydraulic Valve Lifters, 8 page service manual, A.C. spark Plug Division, Flint, Michigan.

Official Standards for U. S. Trucks and Buses, 68 pages, Bear Manufacturing Company, Rock Island, Illinois, 1969.

1969 Official Standards, 22" x 34" chart, available free from Bear Manufacturing Company, Rock Island, Illinois 1969.

One Better, booklet with 30 illustrations, available free from A.C. Spark Plug Division, General Corporation.

Optics and Wheels - A Story of Lighting from the Primitive Torch to the Sealed Beam Headlamp, 33 pages, available free from Black and Decker Manufacturing Company, Power Tools, Towson, Md., 21204, 1967.

Principles of Valve and Valve Seat Reconditioning, 16 pages, available free from Black and Decker Manufacturing Company, Power Tools, Towson, Md., 21204, 1967.

Roto Hydra - matic Diagnosis Guide, 31 pages, available free from Hydra-matic, Division of General Motors Corporation, Willow Run, Ypsilanti, Michigan 48197.

Standards for Automotive Service Instruciton in Secondary Schools, 70 pages, available from Automobile Manufacturers Association, Inc., 320 New Center Building, Detroit, Michigan, 1965.

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The Evolution of Mass Production, 52 pages, available from Educational Affairs Department, Ford Motor Company, The American Road. Dearborn Michigan.

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What Every Car Owner Should Know About Brakes, 2 pages, Marshall-Elipse Division, Bendix Corporation, Troy, New York, Cleveland, Tennessee.

Wheel Alignment Manual, Section 1 - R.M., 19 pages, available free from Bear Manufacturing Company, Rock Island, Illinois.

Wheel Alignment -- Simplified, 8 pages, available free from Bear Manufacturing Company, Rock Island, Illinois.

190

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Automotive Brakes and Power Transmission Systems, by Frazee, Irving, and Bedell, Earl L., American Technical Society, Chicago, Illinois, 1956.

Automotive Maintenance and Trouble Shooting, 3rd Ed., American Technical Society, Chicago, Illinois, 1963.

Automotive Suspensions, Steering, Alignment and Brakes, 4th Ed., Billiet, Walter E. and Alley, Walter, American Technical Society , Chicago, Illinois, 1969.

Automotive Engines Maintenance and Repair, 3rd Ed., Venk, Ernest, and Billiet, Walter E., A.T.S. etc., 1964.

All About Small Gasoline Engines, by Purvis, Jud., The Goodheart-Willcox Company, Inc., South Holland, Illinois, 1963.

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Know Your Car, 2nd Ed., Allen, Willard A., A.T.S. etc., 1967.

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Fix Your Ford V8's and 6's, Toboldt, Bill, Goodheart-Wilcox Company, Inc., 1970.

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Chilton's Automotive Service Manual, Professional Edition, Published by Chilton Company, 56th and Chestnut Sts., Philadelphia, Pennsylvania 19139.

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Automotive Engines, Herbert Ellinger, by Prentice-Hall Inc., Englewood Cliffs, N.J.

Automotive Electrical Systems, Walter Billiet and Leslie Goings, by American Technical Society, Chicago, Illinois.

Engine Repair, Bob Barthouse, by McKnight Publishing Co., Bloomington, Illinois.

Automotive Diagnosis and Tune-Up, Guy Wetzel, by McKnight Publishing Co., Bloomington, Illinois.

1982

VICA - UNIT I

TERMINAL OBJECTIVE

After completion of this unit, the student should be able to name the purposes of the VICA organization. He should be able to write the VICA motto and VICA pledge from memory. He should be able to identify the symbols of the VICA emblem and tell what each represents. He should be able to write what each color of the VICA organization represents and the emphasis of the VICA creed. This knowledge will be evidenced by scoring 85% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Name five (5) purposes of the VICA organization
2. Write from memory the VICA motto
3. Write from memory the VICA pledge
4. Name four (4) beliefs the VICA creed emphasizes
5. Identify the symbols of the VICA emblem and write what each symbol represents.

SUGGESTED ACTIVITIES

I. Instructor
   a. Provide students with objective sheet
   b. Provide students with information sheet
   c. Make transparency
   d. Discuss terminal and specific objectives
   e. Discuss information sheets
   f. Give test

II. Student
   a. Read objective sheet
   b. Study information sheet
   c. Take test

INSTRUCTIONAL MATERIALS

I. Included in this unit:
   a. Objective test
   b. Information sheets
   c. Transparency master - symbols of the VICA emblem
   d. Test
   e. Answers to test

II. Reference
   a. Official Guide, VICA

VICA -UNIT I

INFORMATION SHEET

I. PURPOSES OF THE VICA ORGANIZATION

a. To unite in a common bond all students enrolled in trade and industrial education.
b. To develop leadership abilities through participation in educational, vocational, civic, recreational and social activities.
c. To foster a deep respect for the DIGNITY OF WORK.
d. To assist students in establishing realistic vocational goals.
e. To help students attain a purposeful life.
f. To create enthusiasm for learning.
g. To promote high standards in trade ethics, workmanship, scholarship and safety.
h. To develop the ability of students to plan together, organize and carry out worthy activities and projects through use of the democratic process.
i. To foster a wholesome understanding of the functions of labor and management oraganizations and a recognition of their mutual interdependence.
j. To create among students, faculty members, patrons of the school, and persons in business and labor a sincere interest in and esteem for trade, industrial and technical education.
k. To develop patriotism through a knowledge of out Nation's heritage and the practice of democracy.

II. VICA motto - "Preparing for leadership in the World of Work"

III. VICA pledge - "UPON MY HONOR, I pledge

a. To prepare myself by diligent study and ardent practice to become a worker whose services will be recognized as honorable by my employer and fellow workers.
b. To base my expectations of reward on the solid foundation of service.
c. To honor and respect my vocation in such a way as to bring repute to myself.
d. And further, to spare no effort in upholding the ideals of the Vocational Industrial Clubs of America."

IV. VICA creed emphasizes a belief in:

a. The dignity of work
b. The American way of life
c. Education
d. Fair play
e. Satisfaction achieved by good work
f. High moral and spiritual standards

V. Colors of the VICA emblem

a. Red and white - represent the individual states and clubs
b. Blue - represents the common union of the states and clubs
c. Gold - represents the individual

VI. Symbols of the VICA emblem

a. Shield - represents patriotism
b. Torch - represents knowledge
c. Orbital circles - represents technology
d. Gear - represents the industrial society
e. Hands - represent youth
f. VICA - represents Vocational Industrial Clubs of America

SYMBOLS OF THE VICA EMBLEM

Rings or orbital circles represent TECHNOLOGY

Torch represents KNOWLEDGE

Shield represents PATRIOTISM

Hands represent YOUTH

Gear represents the INDUSTRIAL SOCIETY

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA

197

VICA - UNIT I

TEST

1. Name the purposes of the VICA organization.

   a.
   b.
   c.
   d.
   e.

2. Write the VICA motto.

3. Write the VICA pledge.

   UPON MY HONOR, I pledge
   a. To prepare myself -

   b. To base my expectations -

   c. To honor and respect -

   d. And further -

4. Name four (4) beliefs the VICA creed emphasizes.

   a.

   b.

   c.

(Test Con't)

5. Write what each color of the VICA organization represents.

   a. Red and white -

   b. Blue -

   c. Gold -

6. The VICA symbols represent:

   a. Rings or orbital circles -

   b. Shield -

   c. Torch -

   d. Hands -

   e. Gear -

   f. VICA -

VICA - UNIT I

ANSWERS TO TEST

1. Any five (5) of the following:

   a. To unite in a common bond all students enrolled in trade and industrial education.
   b. To develop leadership abilities through participation in educational, vocational, civic, recreational and social activities.
   c. To foster a deep respect for the DIGNITY OF WORK.
   d. To assist students in establishing realistic vocational goals.
   e. To help students attain a purposeful life.
   f. To create enthusiasm for learning.
   g. To promote high standards in trade ethics, workmanship, scholarship and safety.
   h. To develop students ability to plan together, organize and carry out worthy activities and projects through the use of the democratic process.
   i. To foster a wholesome understanding of the functions of labor and management organizations and a recognition of their mutual interdependence.
   j. To create among students, faculty members, patrons of the school, and persons in business and labor a sincere interest in and esteem for trade, industrial and technical education.
   k. To develop patriotism through a knowledge of out Nation's heritage and the practice of DEMOCRACY.

2. VICA motto - Preparing for leadership in the World of Work.

3. VICA pledge - UPON MY HONOR, I pledge

   a. To prepare myself - by diligent study and ardent practice to become a worker whose services will be recognized as honorable by my employer and fellow workers.
   b. To base my expectations - of reward upon the solid foundation of service.
   c. To honor and respect - my vocation in such a way as to bring repute to myself.
   d. And further - to spare no effort in upholding the ideals of the Vocational Industrial Clubs of America.

(ANSWERS TO TEST CON'T)

4. Any four (4) of the following:

   a. The dignity of work.
   b. The American way of life.
   c. Education
   d. Fair play
   e. Satisfaction achieved by good work.
   f. High moral and spiritual standards.

5. a. Red and white - individual states and clubs.
   b. Blue - common union of the states and clubs.
   c. Gold - the individual.

6. a. Orbital circles - technology
   b. Shield - patriotism
   c. Torch - knowledge
   d. Hands - youth
   e. Gear - Industrial Society
   f. VICA - Vocational Industrial Clubs of America.

201

SAFETY INSPECTION CHECK LIST

☑ GOOD CONDITION ☒ SUGGEST REPAIR OR REPLACEMENT

Customer _____ Phone No. _____

Address _____

City _____ Store _____

Car Model _____ Mileage _____ Lic. No. _____

WHEEL ALIGNMENT

☐ Idler Arm ☐ Tie Rod Ends

☐ Ball Joints ☐ Others

BRAKES

☐ Adjustment

☐ Lining

☐ Drums

EXHAUST SYSTEM

☐ Mufflers ☐ Pipes

SHOCK ABSORBERS

☐ Front ☐ Rear

ELECTRICAL & LIGHTS

☐ Battery ☐ Head Lights

☐ Cables ☐ Tail Lights

☐ Horn ☐ Directional & Brake

VISION

☐ Glass ☐ Wipers

FLUID

☐ Radiator

☐ Battery ☐ Crankcase

☐ Brakes ☐ Transmission

☐ Power Steering ☐ Rear End

☐ SEAT BELTS

TIRES ☐ Front

☐ Rear

PROGRESS RECORD
for
AUTOMOBILE MECHANICS

Training Station: _____ Student: _____

JOB PROGRESS RECORD — CLASS PROGRESS RECORD

TYPICAL JOBS OR OPERATIONS	SEMESTERS				RELATED STUDY TOPICS	CODE	GRADE
	1st	2nd	3rd	4th			

NORM AND CRITERION REFERENCE TESTING

With the advent of educators' ability to identify and write measurable objectives as applied to instruction, evaluation techniques are now changing to reflect this process.

Many instructors involved in college methods and evaluation classes were exposed to, and are familiar with, norm referenced measures.

NORM REFERENCED MEASURES determine an individual's performarce in relationship to the performances of other individuals on the same measuring device. Because the individual is compared with some normative group, such measure are described as norm-referenced. Most standardized tests of achievement or intellectual ability are norm-referenced measures.

Most instructors who are using performance objectives to measure student progress should be familiar with criterion referenced measures.

Criterion referenced measures determine an individual's performance in relationship to some criterion or performance standard. Because the individual is compared with some established criterion, rather than with other individuals, this measure is described as criterion referenced.

Norm referenced measures permit comparisons between people therefore their prime purpose is to make decisions about individuals.

CRITERION REFERENCED MEASURES permit decisions both about individuals and treatments. Criterion reference tests are used to determine whether the learner has mastered a criterion skill and to measure a set of instructional objectives.

Vocational educators are now using criterion measures in creating instructional objectives yet continue to compare individuals with other individuals when evaluating students. There is a need for educators using performance objectives as the basis of instruction to use criterion referenced testing rather than norm referenced testing.

The following evaluation of a skill or procedure is composed as a sample for the instructor. The evaluation is criterion measured since it directly relates to the instructional objectives defined in the unit.

UNIT XV TEST
for
ENGINE OVERHAUL
(Sample Criterion Test Sheet)

Interim Objectives		
1	1.	What can happen to the cylinder head if it is removed while it is hot?
2	2.	Push rods and valves should be placed in a holder so they can be replaced in their _____ positions.
4	3.	How should the cylinder head be cleaned if the coolant passages are badly clogged?
2	4.	What is a valve seat insert?
5	5.	Why should the cylinder head gasket be checked on the block before it is installed?
1	6.	What can be used to polish the main bearing journal?
5	7.	Bearing halves are not _____.
5	8.	How can bearing and journal clearance be checked?
2	9.	How is the vibration damper removed?
5	10.	In the timing gear cover, which way does the oil seal lip face?
3	11.	Why are cam lobe surfaces slighty tapered?
5	12.	When checking for cracks, what part of the block should receive special attention?
2	13.	What must be removed from the cylinders before the piston can be removed from the top?
4	14.	What is the purpose of deglazing the cylinder walls?
4	15.	During cleaning, the pistons should first be soaked in a good _____ removing solvent.

206

Interim Objectives	(Criterion Test Con't)
2	16. What are five criteria for rejecting a piston?
5	17. What should be used to put the rings on the piston?
3	18. Why are service records important?
1	19. What could cause two adjacent cylinders to read low on the compression test?
1	20. What is dieseling?

Teaching Methods

Class Discussion
- Small Group
- Large Group

Committee or Small Group
Demonstrations - Student or Teacher
Role Play or Simulation
Field Trips
Films
Slides, Slide Tapes, Video Tape Recordings
Project - Hands - On
Text Assignments

Checklist Development
Interviewing
Educational Games
Making Transparencies
Develop Bulletin Board
Research
Photography and Media Development
Making Classroom Training Aids
Learning Activities Packages
Open Lab
Resource People

Each unit contains a variety of suggested teaching methods. These suggested methods may be found in the following columns in the document: SUGGESTED LEARNING ACTIVITIES; TEACHER RESOURCE NEEDS; LESSON OR UNIT PLAN.

The producers of this document have made an attempt to identify those methods with which the user may be unfamiliar. A glossary of these terms is included as follows:

METHODS OF EVALUATION

ORAL REVIEW
MAKE COMPARISONS
WRITE STATEMENTS
RANK ORDER
STATE PREFERENCES
MAKING CHOICES
MAKE UP PROBLEMS
CAN PLAY GAME
PLAN AN ACTIVITY
SELF EVALUATION

PEER EVALUATION
COMPLETE A PROJECT
OBSERVATION REPORT
ASSIGNMENT SHEETS
FILL OUT FORMS
TEACHER OBSERVATION
WRITTEN TEST OR QUIZ
REVIEW OF STUDENT RECORDS
CHECKLIST ON PERFORMANCE
REVIEW OF STUDENT ACTIVITY
CONTRACT AGREEMENT

BRINGING IN RESOURCE MATERIALS
REVIEW WORD LIST AND VOCABULARY
STUDENTS FOLLOW DIRECTIONS
RATING SHEETS
RESPONDS TO MEDIA
STANDARDIZED TESTS
DEVELOP A MEDIA PRESENTATION
TEXT ASSIGNMENT
RECORD STUDENT INVOLVEMENT IN A GROUP PROJECT
STUDENT DEMONSTRATION

Each unit contains a variety of evaluation methods which may be used. The producers of this document have made an attempt to identify those methods which would be least familiar to the user of this curriculum. A glossary of these terms follows:

EVALUATION GLOSSARY

Make Comparsions -

The student is given several situations, ideas, etc. and will determine their similarities and differences.

Rank Order -

Giving a particular order or position according to importance.

Making Choices -

Choosing the most appropriate answer; test or procedure for a given situation.

Observation Report -

Having watched or been presented a procedure or other activity, a written or oral report is completed by the student. The student does not actively participate in the activity.

Checklist on Performance -

A list of items or steps which can be compared, scheduled, verified or identified during a student's performance.

Contract Agreement -

A written document mutually agreed upon by a student and instructor which states what the student will accomplish. A time frame and evaluation criteria are also included.

Rating Sheet -

Evaluation arrived at by measuring something against a fixed standard previously established.

Small Group Discussions

The following types of small group instruction can be utilized in this document wherever class discussion is suggested. Certain types of small group discussion are more appropriate than others for specific activities.

The producers of this document have attempted to describe the various small group instructional types in this glossary, but recommend each user experiment with appropriate types of small group as it applies to each unit of instruction.

An ideal size for small group instruction would be eight students. However, in vocational programs, the size of classes may create a situation where a small group may be more than eight.

Tutorial Small Group -

The tutorial small group typically has individual students or small sub-groups working on practice exercises of some sort. These often take the form of special assignments to correct a known deficiency or to teach any kind of activity which requires each participant to demonstrate individually that he can perform the task set for him.

The purpose of using a small group is to insure that each student gets some of the teacher's time.

Task Oriented Small Group -

The teacher gives the small group a task with an explanation of what it is they are to accomplish. Each individual has a job to do. The instructor may assign jobs or leave this up to the individuals within the group to select their own, with each group working on a separate task. The product that each group delivers will have an audience, namely the other groups.

Didactic Small Group -

This term applies to any group in which the teacher is presenting new materials in a teacher dominated classroom setting. This may be a lecture, a demonstration, a film show-

ing and review, chalk talk, or what have you. The purpose of using the small group is that the lesson itself is of sufficient difficulty, that the teacher must have a group small enough to permit intensive questioning by both teacher and students. Expect interaction with questions from the group.

Problem Solving -

In this kind of small group, the teacher presents the group with some kind of problem to solve. The focus is upon identifying the problem, sorting out the various elements, and arriving at a plan of attack. The attention of the students is upon the problem and the process of solving it. The teacher is a resource for helping the group set up the process, but not for solving the problem.

Socratic Small Group -

This is a teacher led discussion, the point of which is to bring out some important principles, concepts, or understandings. The teacher has the conclusion, and by asking questions leads the students to that conclusion. The teacher arranges the answer.

Use this type for getting out the main points of a reading assignment, drawing conclusions from observed phenomena, analyzing the significance of data.

Discursive Small Group -

This group can discuss to help correct misconceptions by a free-flowing, unstructured, and open-ended discussion. The teacher may let the discussion go where it will as long as it serves the purpose. This group can be effectively used after viewing films, field trips, and demonstrations.

Large Group Discussion

This technique is not as you might expect determined by the number of participants, but rather by the actions that take place. Large group instruction consists of one way communication with participants acting only as receivers of concepts, knowledge and principles. It usually is used as the introductory phase to a new unit of instruction where facts, rules, and possibly procedures are given. It may include lecture, films, and guest speakers.

The large group technique is most always followed by one form or another of small group instruction to allow group interaction to take place. This will reinforce large group technique.

The Talking Bulletin Board

A talking bulletin board has all of the elements of a traditional visual bulletin board plus the added feature of an audio presentation.

A teacher or student creates a short sound narrative on an audio cassette recorder of what the individual sees on the bulletin board. This narrative should be no more than three minutes in length.

In using the cassette recorder, the instructor or student verbally takes the observer through the visual presentation narrating the specific information contained in each element of the bulletin board.

Open Lab Technique

This technique is usually used as a follow-up to a teacher demonstration of a hands-on technique. The series of tasks that compose the teacher demonstration are broken down into stations. Each station contains a unique task that collectively will equal all steps in the teacher demonstration.

Each student proceeds through each task until all steps have been accomplished.

An open lab technique can be either a skill that is directly involved with the unit of instruction or centered around a supplementary skill that would ordinarily not be a part of the ongoing instructional program. Usually, the non required skills on the Skill Analysis Chart can be accomplished through open lab technique.

Students may elect to accomplish the open lab technique during any unstructured time, or the teacher may use the technique as a supplement.

Cooperative Vocational Education

This is a method of instruction which aids the student in attaining his/her career objective through first hand exposure. Co-op should be used to improve minimum competency skill development beyond the level provided in the ongoing school-based program.

The Co-op component, as work experience earned in partnership with education, is an important feature of allvocational education programs.

In Vermont, Related Instruction pertinent to Co-op is identified in two parts: (1) Technical Instruction directly related to manipulative skill development of the student and (2) General Occupational instruction directed toward the worker traits aspect of employment.

See Column I of the five column sheet on Cooperative Education page 127 .